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PRINCIPLES OF SURGICAL PRACTICE

POSTOPERATIVE INFECTIONS

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INTRODUCTION

WHEN a patient is subjected to an operative procedure, the barriers which normally serve to prevent the entrance of microörganisms into the body are temporarily let down and he becomes exposed to the danger of the organisms' gaining a foothold and causing an infection. The surgeon is responsible not only for exercising good judgment in determining upon the advisability of operation and the proper steps in the operative procedure but for minimizing the danger of postoperative complications, of which the most important is postoperative infection.

Before the days of Pasteur and Lister, surgery was limited in its scope chiefly because of postoperative infections, which inevitably occurred because of the entrance of microörganisms not only at the time of operation but at every subsequent dressing. Bacteria were transferred directly from patient to patient because of their close proximity in hospital wards, or indirectly through the medium of doctors and nurses and other ward attendants, who had no idea that they were responsible for the epidemics of pyemia, hospital gangrene, and erysipelas which customarily ran through the surgical wards of every hospital.

The modern surgeon knows nothing of this state of affairs unless he has taken the trouble to read the records of those who tried to practice this art sixty or more years ago. Now, he takes it for granted that the hospital in which he works has taken all of the necessary precautions to minimize or prevent postoperative infections, and, if they develop, he is more than likely to put the responsibility on the hospital and absolve himself from all blame. It is perfectly true that the factors involved in postoperative infections are so multitudinous that any given case is seldom an individual responsibility. It is, after all, a group responsibility of the surgical personnel from the surgical chief to the junior interne, from the head nurse in the operating room to the youngest probationer, and from the hospital superintendent to the maids and orderlies. It is extremely important that each member of the staff should feel his or her own share in this group responsibility and by constant effort and meticulous care be certain that his or her share approaches the irreducible minimum. At the same time each member of the group must be on the alert to discover or apply new ways and means to constantly reduce the incidence of these infections in his own hospital.

The development of an infection within the human body depends upon the entrance of some microörganism into the tissues of the body, of sufficient virulence or in sufficient numbers or in such a state of animation that it is able to resist the lethal action of the local tissues or the cellular and humoral elements which are brought to the site through the blood stream. From numerous experiments, it has been determined that in certain animals the introduction of a single virulent

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organism may result in the development of an infection and the death of the animal. On the other hand, the introduction of millions of less virulent organisms may produce no infection whatsoever. In some cases, the introduction of organisms may have to be accompanied by some damage to the local tissues such as contusion, or by some lowering of the general vitality such as chilling or starvation would produce, in order that an infection may develop. In short, after an organism has gained entrance into the body, whether or not an infection follows depends upon the outcome of the interaction between the virulence of the organism and the resistance of the host.

When a patient is operated upon, he may be in perfectly normal health or he may be greatly debilitated either by a severe acute process or a prolonged chronic illness. At the time of operation, a wound is made and the tissues beneath the skin are exposed for a certain length of time to certain conditions set up by the operator and his staff which are designed to minimize the entrance into that wound of microörganisms coming from a number of different sources. Briefly enumerated, these sources are: (1) the skin of the patient: (2) the blood or lymph of the patient: (3) the deeper tissues or cavities within the patient: (4) the nose and throat of the operating personnel: (5) the clothing, shoes, skin, and hair of the operating personnel: (6) the hands, gloves, and gowns of the operating team: (7) the instruments, sponges, compresses, pads, and suture material: (8) the air of the operating room and all of the objects that are in the room or that are brought into the room during the operation: and (9) the nose and throat, hair, skin, clothing, and shoes of visitors.

Organisms from these sources may be introduced directly into the wound by objects which are primarily contaminated and are inserted into the wound, or they may fall into the wound from the air or on objects in the sterile field, which are then introduced into the wound. It seems to me to be extremely important to bear in mind these many sources of organisms and the various means by which they may get into a wound, particularly at this time when certain individuals are laying special emphasis on one factor in this complex problem to the exclusion of others.

However, the operative wound is not the only part of the patient which is subjected to unusual contamination with extraneous organisms during or after an operation, nor is it the only region in which an infection may become established. During the period of ante-operative or postoperative sedation, or during the administration of the anesthetic, mouth organisms may get down into the trachea, bronchi, and bronchioles along with small particles of mucus or vomitus and, failing to be expelled because of the cessation of the cough reflex, may remain long enough to multiply and invade the adjacent epithelium, and thereby produce a lobular or lobar pneumonia or a lung abscess. The congestion and excessive secretion of the mucous membrane which results either directly or indirectly from the administration of the anesthetic may play a part in the establishment of the infection in this region. The unaccustomed bath, drafts in a large ward, excessive perspiration, and vasomotor disturbances of one sort or another are factors of secondary importance, but must be considered in any complete discussion of this problem. The same factors play a rôle also in the development of postoperative sinusitis, tonsillitis, and parotitis.

Of major concern, also, are the infections of the urinary tract, which not infrequently develop following an operation. A spasm of the urinary sphincter or an inhibition of the urinary reflex sometimes makes it impossible for the patient to void, and when all efforts fail, resort is made to a catheter. Various methods are used to minimize the introduction of organisms into the bladder, but it is almost impossible to make catheterization a sterile procedure. With the body in a horizontal position, the bladder usually is not completely emptied and the retained organisms multiply in the residual urine and then irritate and later invade the mucous membrane of the bladder. Still later they may ascend to the kidneys and produce an infection of the pelvis or the interstitial tissues. A bladder which has become overdistended may be thereafter partially paralyzed, which increases the amount of residual urine. If the urine is contaminated before or at the time of catheterization this must be kept in mind and the danger of overdistension weighed against the danger of further contamination by repeated catheterization. In any case, spontaneous voiding is to be encouraged by all kinds of conservative measures, glycerin enemas being perhaps the most effective.

Infections of the lungs and liver from septic emboli of the venous or portal systems, respectively, likewise fall into the group of postoperative infections which we have to consider. Aseptic emboli to the lungs which produce infarcts may be secondarily contaminated by aspirated mucus containing mouth organisms.

A recognition of these various sources of contamination is essential to a solution of the problem

of postoperative infections. Gradually a knowledge has been acquired of ways and means to close the doors of these sources, to thus minimize the entrance of organisms into the body, to minimize the development of an infection by them, and to overcome any infections which develop in spite of all precautions.

Let us consider these matters more in detail: (1) ways and means to minimize the contamination of the wound at the time of operation: (2) the ways and means to prevent the development of an infection by those organisms which get in, in spite of all of our precautions: and (3) the methods of treating wound infections which develop.

1. MINIMIZING CONTAMINATION

A. From the Nose and Throat of the Operating Personnel

J. STAIGE DAVIS. When an observer goes to the operating room of another clinic, one of the first things that comes under his notice is the masking of the operator and the operating team, and from that he is able to judge, to some extent at least, the quality of the technique used in that operating room. If the operator or any of the team is inadequately masked, then with this as a definite break in technique, one is inclined to be somewhat skeptical about the rest of the protection for the patient, which cannot be so easily observed (4).

If one observes the methods of masking in various clinics and hospitals, it is astonishing what variations can be seen both in the types of masks themselves, and in the methods of using them. In the majority of hospitals, the masks are much too small and are therefore uncomfortable; they are too thin to be effective, and in addition are often worn improperly.

One frequently hears this remark. "I do not cover my nose, and do not intend to, as a mask is uncomfortable, my glasses become fogged and furthermore my infection rate is low." This, of course, is a stupid attitude to take, because few operators or members of operating teams know whether they are hemolytic streptococcus or staphylococcus carriers or not, and not one in these groups knows when he may become infected, especially in the winter epidemic season.

Meleney (20) found that 33 per cent of the operating personnel in a New York hospital, with no epidemic going on, harbored the hemolytic streptococcus, and almost all of it carried the staphylococcus aureus. Walker (29), in Boston, during two epidemics found that the streptococcus carriers in the operating personnel amounted to 50 and 58 per cent, respectively.

When we realize that microörganisms are constantly being showered from the unmasked nose or mouth into the wound during ordinary respiration, it is appalling to see an operator, inadequately masked, breathing into an open abdomen, an exposed brain, a wide-open breast defect, an opened joint, or any other wound for say an hour or longer.

It is my belief that every person who enters the operating room at any time should be properly masked. The chief surgeon and the head supervisor are just as liable to be hemolytic streptococcus or staphylococcus carriers as the orderly. When observers, either surgical or medical are admitted to the operating floor, they should be as carefully masked and gowned as the operating team. I also believe strongly that adequate masking is particularly essential in out-patient departments for the operator and his assistants.

Now what is meant by adequate masking? The nose and mouth must be covered in such a way that organisms will be filtered out by the protective covering or deflected away from the sterile field. Four-ply gauze masks of unbleached muslin will filter out most of the droplets and dust particles which carry the great majority of the expired bacteria, but not those individual organisms or the fine dust suspended in the current of air. Smoke will go through these masks and so we must assume that bacteria will. The only certain barrier is an impermeable membrane of some kind—film, cellophane, or rubber—incorporated in or on either side of the mask. While such a layer does not permit the passage of bacteria, the bacteria are deflected around the sides by air currents. They do the least harm if they are deflected downward into the sterile gown. This can be accomplished for all practical purposes by a helmet covering the mask.

B. From the Air

CORNELIUS J. KRAISSL. The use of ultraviolet radiation as a bactericidal agent is not new but its value for the destruction of the organisms in the air of an operating room has been demonstrated only recently (7, 13, 32).

Our first studies were aimed to determine the zone in the ultraviolet spectrum which would be most bactericidal for the organisms commonly found in wound infections and which would cause the least unfavorable reaction to the tissues. This was found to be best obtained from a low pressure

mercury vapor tube designated as a "monochromatic" generator. Bactericidal determinations were made on plates seeded with the various organisms and compared with the bactericidal action on the same organisms when suspended in the air. It was found that it was from 6 to 10 times as easy to destroy bacteria in the air as it was when they were planted on the culture plates.

Loops of guinea pig's viscera were exposed for various periods of time and the intensity which produced adhesions in the succeeding week was recorded. A graph was plotted comparing the bactericidal effect on the seeded plate with the adhesion-producing effect on viscera, and it was found that the bactericidal effect for all of the wound-infecting organisms was always well within a safety zone in which adhesions would not be produced.

Studies were made on the bacterial content of the air of the various operating rooms and it was found that the rooms were relatively free when unoccupied but that the content quickly rose when patients, doctors, nurses, and others entered and began their activities.

It was also found that the predominating types of organisms were the staphylococcus albus and aureus which account for most postoperative wound infections. When we realize that the total number of organisms falling on the sterile field varies during an hour's time between 30,000 and 60,000, it seems that some attempt should be made to combat this contamination provided that no harm is done to the patient's tissues and that the inconvenience to the operating staff is not so great as to interfere with their efficiency or comfort.

The most important area in the room, when an operation is in progress, is immediately above the wound and is the one which should receive the greatest attention. A circular illuminating unit was therefore designed with an open top to reduce the heat and to permit a gentle updraft through the opening immediately above the operative site. A circular ultraviolet generator was applied to this unit so as to focus on the critical zone; thus, bacteria entering this zone either by the exhaled air of the operators or by other operating-room air currents are exposed to the maximum intensity of radiation. Furthermore, they are drawn upward away from the wound and in all probability are destroyed by the intensity of the rays to which they are subjected. In addition, auxiliary wall units are so placed that the down-draft from the air conditioning supply is adequately radiated. The intensity of the combined radiations has been carefully measured in every cubic foot of the operating room and so regulated that the amount can be tolerated by the tissues of the patient. The heads of the operating team being closer to the rays should be further protected by helmets, visors, and glasses to cover any exposed skin and thus prevent erythema. With this arrangement the bacterial colony count has been reduced to one-tenth of the original number. Data on wound healing are now being gathered on the cases operated upon under this radiation and figures should be available in another year or two.

C. From the Hands of the Operators

MARTIN B. TINKER. Scrubbing alone can make the hands bacteria free. This was demonstrated early by Lawson Tait (27) of Birmingham, England, and Schleich (25) of Berlin. Bacteriological tests on Cornell students under the direction of one of us (M. B. T.) have also demonstrated that hands smeared with spore-forming, resistant, nonpathogenic bacteria can be made bacteria-free. However, scrubbing alone requires time, system, and thoroughness. Because of the time consumed (20 minutes minimum), the use of some reliable antiseptic following the scrub-up is desirable (28).

It is advisable to have a routine procedure which all shall follow in the preparation of their hands and arms. The nails should first be cleaned and cut. Scrubbing should be timed by a clock or hour glass but time is not more important than care, completeness, and vigor. The scrub should be systematic, beginning with the cleanest areas, the arms three inches above the elbow, and working down the forearms to the hands—the backs, the palms, and the fingers, including the sides. The nails, especially underneath the free margin, should be given the most thorough attention with brush and orange stick. Sterile brushes should be used and they should have firm but not harsh bristles. Scrubbing should last not less than five nor more than ten minutes according to the vigor of scrubbing. Sterile liquid soap or, as recommended by Walker (30), a cocoanut oil soap may be used. After scrubbing, which, if thorough, may remove the great majority of surface microörganisms, there seems to be a considerable difference of opinion with regard to the use of a skin antiseptic. It has been demonstrated that it gives a wider margin of safety and we believe it should be employed. Price (23) in a recent study has shown the effectiveness of scrubbing and antiseptics in rendering hands and arms surgically clean.

As a hand disinfectant, chlorinated lime and sodium carbonate paste has been found efficient.

Chlorinated solution in obstetrics was suggested nearly a hundred years ago by Holmes (9) and later by Semmelweis (26). For hand disinfection, a handful of each powder is taken up and they are mixed in the hands in a basin of sterile water. The hands and arms up to the elbows are covered with the mixture, which gives off chlorine gas rapidly. Care should be taken to get the mixture under the nails with an orange stick. Some of this may remain long after the operation. The arms and hands are then washed with a spray of or sponged with 70 per cent alcohol (by weight), then with 1:1,000 bichloride of mercury, and dried on a sterile towel.

Glove technique. Rubber gloves were introduced in surgery by William S. Halsted (6) and are now in almost universal use. Halsted's methods are still employed by his former students and assistants at Johns Hopkins Hospital. If rubber gloves are carefully cleaned after use, boiled and stored for one-half hour in an antiseptic solution which kills spores within that time or less, they may be considered safe for use, and will give service over a much longer time than if sterilized under steam pressure. Halsted used operating gloves much heavier than are generally found in operating rooms today. It is possible to feel well through a properly fitted glove even if it is of heavy or extra heavy weight. Gloves should be discarded as soon as the rubber loses its freshness and full elasticity, because older gloves of dead rubber puncture and tear too easily to be safe. The lighter weight gloves puncture altogether too easily. It is desirable to have the operating room nurse keep a record of the number of punctures that occur, and hold the members of the operating team responsible for punctures caused by careless or rough use. If such a practice is followed, the number reported each month, in the majority of operating rooms, will at first surprise the attending surgeons, and if the members of the operating team realize that their punctures are being checked, they will take greater care. A considerable number of minute punctures escape detection even by inspection of the most careful operating-room nurse. This is an important argument in favor of putting on gloves out of solution rather than dry, as is the practice in many operating rooms. It is surprising to see a tiny stream of water spurt from the finger of a glove when the glove is put on the hand, the puncture having been entirely overlooked in spite of the fact that the operating-room nurse had thoroughly distended each glove finger separately with water when inspecting. The number of such minute punctures which escape detection by the dry-glove method will probably average 1 or 2 per cent, at least. Such undetected punctures undoubtedly account for a number of mysterious infections which are so difficult to trace. Evident punctures or tears, either seen or felt, should be an indication for immediate change to freshly sterilized sound gloves.

FRANK L. MELENEY. Recently, glove manufacture has been improved so as to permit autoclaving without great damage. This makes the dry technique possible. For those who still prefer to use the dry-glove technique certain precautions should be observed. The hands should be dusted with sterile powder before the gown is put on so as to avoid contaminating the gown with powder which has touched the hands. The stockinette wrist band on the gown wipes off excess powder. The sterile nurse holds the gloves by the everted cuffs so that the surgeon may insert his hands directly into the glove without the possibility of contamination of the outside. The unsterile nurse who is the first to put on gloves should use gauntlets which can be donned without contamination from the hands—a thing which cannot be done with the newer gloves. After holding the doctor's gloves she may then discard the gauntlets and thinner gloves may be held for her.

D. From the Skin of the Patient

MARTIN B. TINKER. Skin preparation mostly involves parts of the body ordinarily protected. Such skin is too sensitive to permit vigorous scrubbing with a brush. The first preparation is in the ward. The skin is shaved and then scrubbed with gauze sponges, frequently changed, saturated with liquid soap and water. This is followed by ether and alcohol. A protective aseptic dressing may then be applied. Repeated scrubs on three successive days, over a wide area, as specified by the Orthopedic Service of the United States Army during the World War, adds much to the safety of preparation, particularly if, as in most reconstruction surgery, the operative field has been previously infected. Chlorinated lime paste (United States Army, Orthopedic Service) is the best antiseptic for the patient's extremities, but is too harsh for the neck, chest, and abdomen of many patients. On the operating table the skin is rubbed with sponges soaked with alcohol and again with ether until the sponges come away without showing soiling. The scrub should begin along the lines of incision, each wipe of the sponge working toward the periphery in concentric strokes. Do not return from the outer unsterile area to the prepared area along the line of incision, but discard the sponge and begin with a fresh one.

The skin "antiseptic" is then applied Various chemical substances have been advocated, which would seem to indicate that a perfectly satisfactory one has not yet been found. The chief difficulty seems to be that none of them can penetrate the pores sufficiently to kill the organisms there. The only reasonable test for the efficiency of a skin antiseptic is to determine the sterility of a piece of the full thickness of the skin at the line of incision. Such tests have not as yet revealed any antiseptic which will produce 100 per cent sterility.

Tincture of iodine is probably more generally used than any other antiseptic, but it only gave from 55 to 86 per cent sterility in several reported series of tests by American, English, and German workers several years ago. The burning propensities of iodine have led some surgeons to prefer certain other antiseptics, such as picric acid, mercurochrome, merthiolate, gentian violet, acriflavine, and metaphen. Solutions of these substances in alcohol and acetone render them more penetrating and therefore more efficient. Five per cent acriflavine in 50 per cent alcohol and 10 per cent acetone was found to give the best results in several series of experiments carried out under the direction of one of us (M. B. T.) a number of years ago at Cornell. Recently Walter (31) has advocated for skin preparation a mixture of cocoanut-oil derivatives, called "zepheran," which is a detergent and is not only cleansing but antiseptic. The burning propensities of iodine may be largely obviated by complete evaporation and partial removal if the patient is red-headed or a very light blonde. Some writers report lowered antiseptic efficiency from this procedure. Certain watery solutions of iodine which are just as effective as the tincture and less irritating to the skin are now available. The perfect skin antiseptic, however, has not yet been found and in order to minimize contamination of the wound by organisms coming to the skin surface during the course of an operation towels should be clipped to the wound as soon as the incision has been made.

E. From the Supposedly Sterilized Materials

This phase of the problem is covered by the report of Dr. Elliott Cutler's panel discussion which appears on page 414 of this issue.

2. MINIMIZING THE DEVELOPMENT OF INFECTION IF THE WOUND BECOMES CONTAMINATED

A. Minimal Trauma

J. STAIGE DAVIS. The gentle handling of all tissues is most important. It is interesting to observe the difference in the way in which surgeons handle tissues. One will use the greatest care, and his work in consequence may be somewhat slower than the other. The other is heavy handed and shows little consideration for the tissues but does fast accurate work. The results, as far as infection is concerned, and also the final results are, as a rule, largely in favor of the man who has handled the tissues in a careful manner.

Sharp cutting instruments should be used in making incisions and dissections; retraction should be as gentle as possible and should not cause bruising; the crushing of masses of tissue when using artery clamps should be avoided; blotting rather than rough wiping with gauze sponges is to be preferred; aspiration should be used in place of sponging when possible; rough grasping of the skin and other tissues with thumb forceps is inadvisable and the thickness of the skin should never be grasped with an artery clamp. By the use of small sharp hooks and mosquito mouse-tooth thumb forceps, unnecessary bruising of the skin and of the other tissues may be avoided.

Adequate hemostasis is also most important. The individual bleeding point should be picked up with as little of the surrounding tissue as possible. Vessels should be tied with fine silk in all clean cases. If there is any doubt as to the possibility of infection, then fine catgut should be employed.

As few ligatures as possible should be used. Checking the bleeding with the coagulating current is useful but care must be taken to char as small an amount of tissue as possible to avoid leaving spots of necrosis in the wound.

In addition to the gentle handling of tissues and thorough hemostasis, every care must be taken to conserve the maximum blood supply and nourishment of the tissues operated on. Incisions must be planned with that purpose in view and every effort should be made not to interfere with the nourishment of cells in the wound margins which function in the healing of the wound.

Too much tension must be avoided. If sutures, either buried or in the skin, are tied too tightly, the circulation is interfered with and pressure necrosis occurs.

The material for skin sutures varies in different clinics, but this is not of very great importance because these sutures are usually removed. Catgut should not be used for skin sutures. Subcuticular catgut frequently becomes infected. It is better to use fine black waxed silk, horsehair, fine wire, or fine silkworm gut. Horsehair, which is quite smooth and impervious, in addition has the facility of stretching slightly. When the wound edges become edematous and swell, as they always do to some degree, and particularly when catgut is used in the deeper tissues, rigid sutures do not stretch, and the points where they emerge from the skin undergo excess pressure for several hours at least, and often necrotic areas develop. On the other hand, when this swelling develops, the horsehair stretches and these necrotic areas are largely avoided. Dressings should be applied carefully and smoothly, and should be comfortable.

The healing of all wounds is accelerated, and infection is minimized by absolute immobilization and rest of the area operated on.

B. Minimal Irritating Foreign Bodies Including Suture Material

J. STAIGE DAVIS. Before closing the wound, all clots, tissue fragments, and tags of tissue strangulated by ligatures should be removed as this devitalized material furnishes excellent pabulum for microörganisms. The removal of this detritus, and with it many air-borne bacteria, may be accomplished by flushing with normal salt solution. Excellent results are also obtained by the use of sterile soap and water solution in washing out clean operative wounds. For many years in my reconstructive work, ether has been used freely for this purpose and does not interfere with perprimam healing. The use of alcohol and of other coagulating antiseptics, such as bichloride of mercury in a 1:1000 solution in clean operative wounds or on any wound, should not be tolerated because much tissue damage results and healing is retarded.

In closing the wound, small needles which slip through with little damage to the tissues and the finest suture material compatible with the stress required should be used. Coaptation should be accurate and all of the dead spaces should be eliminated.

Interrupted sutures are to be preferred, and these should not be tied too tightly. In all clean cases silk may be safely buried and the local reaction will be much less than when catgut is used. The silk should be the finest that will accomplish the purpose for which it is used, and the tissues included should not be strangulated by the sutures. Fine steel wire is also used frequently and gives no reaction, but on account of its strength, it is often drawn much more tightly than is necessary and strangulation of the included tissue results. The strangulation of normal tissue included in a suture or ligature may seem unimportant but where there is interference with the blood supply and necrosis occurs, there is a point for infection to begin, in the event that any pathogenic organisms are present.

C. Immunity Factors

CHAMP LYONS. In considering the immunological defenses of the body against postoperative infection, it should be remembered that there are two mechanisms which are important in recovery. One of the mechanisms is the process of inflammatory fixation, whereby lymphatic and vascular capillaries are occluded around the zone of infection with a resultant exteriorization of the bacterial invaders. This isolation of the infection is important because it renders the zone of infection impermeable to circulating immune bodies of large molecular size. Hence, immune bodies cannot influence the course of an abscess, and unless the abscess is very small, surgical drainage or spontaneous evacuation is necessary for recovery (18).

The second body mechanism which deals with infections consists in the development of antibacterial and anti-toxic antibodies. These are active in the control of an infection only during the time that the inflammatory lesion can be permeated by the large size molecules possessed by such antibodies. In other words, antibodies are useful only during the invasive phase of the infection. There is a single exception to this general principle. It occasionally happens that an abscess involves the blood vessels and establishes septic intravascular thrombi from which bacteria may be distributed into the blood stream. Such a bacteriemia is favorably influenced, and metastatic abscesses are frequently prevented by the presence of immune bodies in the blood.

Besredka (2) and also Gay (5) have shown that local tissues which have recovered from an infection possess for a short time a resistance to the same infection not possessed by other tissues in the body. This resistance has been called local immunity but it is not well understood. There is evidence that it is associated with and perhaps due to the presence of large mononuclear phagocytes.

3. THE TREATMENT OF AN ESTABLISHED WOUND INFECTION

A. Surgery

JOHN S. LOCKWOOD. When a wound infection develops and pus has formed, the wound should be opened to full length of the involved portion. Anaerobic as well as aerobic cultures should be taken and the causative organism determined. Then the appropriate secondary treatment may be decided upon. If the temperature is low and there do not seem to be any severe general disturbances, which indicate a relatively trivial infection, the mere opening of the wound may be sufficient to cause a prompt recovery. If it is more serious the local application of specific or non-specific antiseptics may be advisable. If there is high fever, wide cellulitis, and evidence of general intoxication, internal as well as local medication is needed.

B. Local Secondary Treatment

STAPHYLOCOCCUS BACTERIOPHAGE

JOHN S. LOCKWOOD. This medication should be used if the organism is a staphylococcus susceptible to the available phage. The bacteriophage should be applied to the wound once or twice a day and directly contact all the infected surfaces (11).

ZINC PEROXIDE

This is to be used if the infecting organisms are anaerobes or hemolytic streptococci. With this medication the three essential requirements are: (a) an effective material properly sterilized and activated; (b) close contact between the creamy suspension of the powder in distilled water, and (c) moist coverings over the wound with an impermeable seal to keep the dressing wet (21).

HYPOCHLORITE SOLUTION

This solution is to be prepared and used according to Carrel-Dakin technique. It probably owes its beneficial effects more to its capacity to liquefy slough and necrotic tissue than to a direct lethal effect on the organisms responsible for the continuance of the infection (3). When the tissue slough is removed the bacteria are unlikely to be able to survive and elaborate their toxins. A most important factor in encouraging wound repair is the removal of necrotic tissue. Maggots (1) and their purified secretions in the form of allantoin (24) have been employed to induce similar effects, but, in our hands, have not been as effective as hypochlorite solution.

Some success has been reported from the local introduction of crystallin sulfanilamide into compound fracture wounds (10), but experience is as yet insufficient to warrant a blanket recommendation of this type of therapy, because of the possible danger of acute toxic reactions.

X-RAYS

Most radiologists are convinced of the value of small doses of x-rays in the treatment of local tissue infections (12). While there is a good deal of belief among surgeons that x-ray therapy is beneficial in special types of infections such as postoperative parotitis, it is as yet impossible to agree that x-ray therapy is indicated in all types of postoperative wound infections.

Caution in the employment of x-ray therapy is recommended until more is known of the mechanism of the action of x-rays in infections, until the possible harmful effects are understood, and until it becomes apparent that x-rays produce effects which cannot be obtained by simpler and cheaper measures such as hot wet dressings.

C. General Secondary Treatment

BACTERIOPHAGE

FRANK L. MELENEY. For serious staphylococcus and bacillus-coli infections, particularly when there is a septicemia with these organisms, "doubly potent" bacteriophage should be employed intravenously. High potency stock phage should be started as soon as a positive culture is reported and the organism should be tested for susceptibility to the phage as soon as possible. By "doubly potent" phage is meant one which not only produces lysis or clearing of the culture in liquid medium but shows no growth when the cleared culture is planted on a blood agar plate. If the stock phage is not "doubly potent" it should, if possible, be worked up by frequent passages until it is. The initial dose of phage should be small, from 0.1 or 0.25 c. cm., but if no reactions occur it should be increased rapidly up to large doses, the amount and duration of treatment being determined by the requirements of the individual case (17).

SULFANILAMIDE COMPOUNDS

JOHN S. LOCKWOOD. These are of value postoperatively, particularly in the treatment of acute invasive hemolytic streptococcal infections (14). At the present time sulfanilamide orally or parenterally can also be recommended as an adjunct to other procedures in the prophylactic management of any severe traumatic or operative injury

when invasive infection is a likely postoperative complication.

The effectiveness of the sulfanilamide will be limited unless the dosage is given at frequent intervals so as to maintain a fairly constant blood level of more than 5 mgm. per cent. It will also be limited if there is extensive necrosis of tissue in the area of infection. Its effectiveness is apparently increased in infections of serous cavities in which a strong cellular defense tends to supplement the bacteriostatic effect of the drug. When sulfanilamide is used for postoperative infections the treatment can usually be stopped within from five to seven days, so that the serious toxic reactions encountered with prolonged therapy are not likely to occur. Daily blood counts must be made in order to guard against hemolytic anuria and granulocytosis.

Sulfapyridine is of great value in postoperative pulmonary infections, particularly those in which the pneumococcus is responsible. In the past few months sulfathiazole has been found to be quite as effective against the pneumococcus as sulfapyridine and is preferable because it is less nauseating and less toxic.

While sulfanilamide, sulfapyridine, and sulfathiazole all seem to possess some degree of effectiveness against the staphylococcus in the test tube and in animals, their relative effectiveness in human infections has not yet been determined. None has an effect against this organism comparable to that enjoyed by all against the hemolytic streptococcus. For general staphylococcal infections, however, sulfathiazole may be employed in conjunction with doubly potent bacteriophage. None of the sulfonamide group of drugs interferes with phage action (33). The severe toxic effects which are reported for sulfamethylthiazol make that drug too dangerous to employ.

SERUM TREATMENT

CHAMP LYONS. It seems pertinent to briefly review the nature and properties of the immune bodies as they exist for the microörganisms of surgical importance.

Staphylococci. Numerous antibodies are described for staphylococci and their toxic products. The commercially available antitoxin neutralizes the staphylococcal hemolysin. Rabbits are susceptible to this toxin, and the antitoxin favorably influences the course of staphylococcal infection in rabbits. This is the basis for the use of such an antitoxin in human beings, but all available evidence indicates that the human being is not very susceptible to the action of this hemolysin. Human leucocytes are susceptible to a staphylococcal leucocidin, but no effective antileucocidin sera are commercially available. Anti-bacterial antibodies have been recognized for the staphylococcus, and it is possible to divide the staphylococci into several types with such sera, but if one attempts to find some correlation between the presence or absence of these anti-bacterial antibodies and the eventual outcome of infected patients, it cannot always be demonstrated that survival from a staphylococcus bacteriemia is associated with the presence of antibodies of this type. Furthermore, it has been shown that inflammatory fixation occurs so rapidly with staphylococcus infection, that it is unlikely that circulating immune bodies could effectively influence the course of such infections.

Hemolytic streptococci. The important antibody in streptococcal infections is the anti-bacterial antibody, and it is effective in influencing the course of the infection favorably. For several years infected patients have been passively immunized by the method of immunotransfusion (19). The introduction of sulfanilamide has not made this procedure unnecessary. The combination of immune serum and sulfanilamide is so much more effective than either one alone that their use should be combined. A partial explanation of this lies in the fact that sera of low potency are now useful when given with sulfanilamide, and that sulfanilamide alone has sometimes failed to completely control streptococcal infection in a satisfactory manner.

Colon bacilli. Increasing experimental evidence demonstrates that the colon bacillus contains a toxic substance which can be neutralized by an appropriate immune serum (8). The toxic component of colon bacillus is an endotoxin, and, hence, the immune serum is limited by the fact that it can neutralize at most only a few minimal lethal doses of the substance. Various strains of colon bacillus contain various types of endotoxins, so that an effective antitoxin must be specific for the particular infecting strain. Specific and potent sera are not yet generally available for use with bacillus-coli infections.

THE IMPORTANCE OF RECORDS

FRANK L. MELENEY. The necessity for accurate and complete records in every hospital where any attempt is made to study and solve this problem must be fully appreciated. General impressions are of no value whatsoever. This was amply proved at the Presbyterian Hospital in New York City when a careful study of wound infection was initiated in 1925. The occurrence of several hemo-

WOUND INFECTION OVER A PERIOD OF FIFTEEN YEARS, PRESBYTERIAN HOSPITAL, NEW YORK, NEW YORK

Year	Total Cases	Clean Cases		Infected Cases					
		Number	Per cent	Serious	Per cent	Trivial	Per cent	Total	Per cent
1925	558	482	86	20	4	56	10	76	14
1926	581	494	85	22	4	65	11	87	15
1927	653	555	85	16	3	82	12	98	15
1928	640	571	89	10	2	59	9	69	11
1929	771	703	91	17	2	51	7	68	9
1930	747	674	90	23	3	50	7	73	10
1931	950	883	93	16	1.7	51	5.4	67	7.1
1932	1053	997	95	12	1.1	44	4.2	56	5.3
1933	1132	1078	95	13	1.1	41	3.6	54	4.8
1934	1279	1232	96.3	11	.9	36	2.8	47	3.7
1935	1417	1373	96.9	9	.6	35	2.5	44	3.1
1936	1558	1509	96.9	10	.6	39	2.5	49	3.1
1937	1554	1517	97.7	13	.8	24	1.4	37	2.2
1938	1668	1633	97.8	8	.5	27	1.6	35	2.1
1939	1725	1681	97.4	10	.6	34	2.0	44	2.6

lytic streptococcus wound infections in clean cases led one of the authors to ask the head of one of the surgical services what he thought the incidence of wound infections would be on his wards. He replied that he thought if every trivial and serious infection were counted that it would amount to 2 per cent. A careful survey revealed that in the year 1925 it was 14 per cent. Ever since then there has been a continuous study of postoperative infections. They are reported each week at the Staff Conferences and once a year a detailed summary is presented with an analysis of individual cases. This has kept every member of the staff alive to his own responsibility in maintaining his sterile technique at the highest possible level. Each year modifications in the sterile technique have been instituted where weaknesses were shown to exist and this has resulted in a gratifying lowering of the incidence both of the trivial and the serious infections, as the accompanying table shows (*22*).

It has been found advisable to have some member of the staff who is made responsible for a review of every case record. Notes are kept on individual cards of all important details of the operation and of the postoperative course in relation to the wound healing. A copy of such a record card is given below. If such records could be kept by a number of clinics with a periodical comparison of results and methods, there would be a steady improvement of sterile technique which might then serve as an example to smaller hospitals unable to carry on such studies.

WOUND HEALING

OPERATIONS 1st 2d 3d
Clean
Hematoma
Stitch Abscess
Necrosis
Disruption
Drained
Silk
Catgut
TRIVIAL INFECTION
SERIOUS INFECTION

ANALYSIS

REMARKS

Operation—

Operator—
1st Asst.—
2nd Asst.—
1st Sterile Nurse—
2nd Sterile Nurse—
Anesthetist—

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STERILIZATION AND ASEPTIC OPERATING-ROOM TECHNIQUE

ELLIOT C. CUTLER, M.D., F.A.C.S., Boston, Massachusetts—Presiding

Collaborators: CARL W. WALTER, M.D., Boston, Massachusetts; DERYL HART, M.D., F.A.C.S., Durham, North Carolina; FRANK L. MELENEY, M.D., F.A.C.S., New York, New York; E. E. ECKER, Ph.D., Cleveland, Ohio; EARLE H. SPAULDING, Ph.D., Philadelphia, Pennsylvania

INTRODUCTION

THIS Panel Discussion will attempt to cover the more important phases of sterilization and aseptic operating-room technique. Obviously we cannot go into great detail, but we have experts here who are prepared to do their utmost to answer questions put to us in this field. We shall attempt to cover first the least controversial subject in this field, The Sterilization of Dressings and Dry-Goods. Presumably every doctor has seen an autoclave in action and understands that sterilization by steam under pressure is the most desirable method. However, I fear few doctors have ever run an autoclave, and almost no doctors appreciate the primitive physical difficulties which are inherent in the autoclave. It appeared simpler and more rapid to demonstrate this topic by a moving-picture reel. When this is over I hope the dangers of autoclave sterilization will be clear.

The movie portrays the customary hospital practice in sterilizing dressings, indicates the errors in the traditional technique, illustrates the physical and bacteriological principles involved, and builds up a safe technique by applying these principles. The extraordinary responsibility assumed by personnel and the need for constant, intelligent supervision is emphasized. Standardization of packaging and loading is recommended and the acceptance of a uniform minimum for sterilization is advocated.

Immediately following this presentation we shall expect questions from the floor to elaborate further upon our general topic, Sterilization and Aseptic Operating-Room Technique.

Surgeon-in-Chief, Peter Bent Brigham Hospital, Moseley Professor of Surgery, Harvard Medical School, Boston, Massachusetts.

Panel Discussion, Clinical Congress of the American College of Surgeons, Philadelphia, Pennsylvania, October 17, 1939.

THE STERILIZATION OF DRESSINGS AND DRY GOODS

CARL W. WALTER, M.D., Boston, Massachusetts

THE sterilization (17, 19) of surgical supplies requires a reliable, readily available, inexpensive agent which destroys all microbial life but which does not deteriorate such supplies. Saturated[1] steam has been adapted for this purpose because of its rapid action and its general applicability. Steam is a reliable microbicide with definite limitations which are well known because its lethal action depends upon physical properties which are measurable. In the range of temperature and pressure ordinarily used for sterilization, the abstraction of heat from steam, as by contact with a cold object, causes a change in its state of aggregation. Dissipation of its heat of vaporization is attended with a marked decrease in volume because of the condensation from vapor to water. Thus, steam simultaneously provides the two essentials for the destruction of bacterial life—heat, in the form of latent energy, and moisture, in the form of a condensate. Factors which decrease or nullify the lethal effect of saturated steam have been described, but their importance has been appreciated by few surgeons.

The use of steam as a sterilizing agent has become a mysterious process to most surgeons because the responsibility for the maintenance of a stock of sterile surgical supplies has been delegated to subordinates. Too often, convenience and expediency have prompted the improvisation of

From the Laboratory for Surgical Research, Harvard Medical School, and the Surgical Clinic, Peter Bent Brigham Hospital.

[1]By saturated is meant that the pressure of the steam is the greatest possible for water vapor at the given temperature. The vapor, therefore, is in a state lying on the boundary between two phases of aggregation, in this case between liquid (water) and vapor (steam).

"sterilizing" techniques (4, 5, 8, 13, 21) by those ignorant of the basic biological and physical facts which determine the efficacy of steam as a bactericide. Local tradition and custom thus define sterilization with dictatorial finesse.

Most hospitals are equipped with sterilizers which are capable of destroying all bacterial life if they are properly loaded with carefully packaged supplies and are operated intelligently. The surgeon's chief concern in sterilization, safety for his patient, can be assured most readily by the standardization of technique for steam sterilization. The basic principles upon which a reliable technique must rest are demonstrated in the accompanying graphs which were selected from the diagrams shown during the Midday Panel Discussion (6) in the motion picture "Aseptic Technic."

The application of well substantiated physical and bacteriological observations to the development of a correct technique for the sterilization of surgical supplies in the steam sterilizer requires consideration of the following recommendations:

1. Adoption of bacteriological standards known to assure absolute sterility.

2. Intelligent modernization of sterilizers to provide:

   a. An adequate quantity of steam (pounds of steam per hour rather than pressure head) to permit prompt heating of the load.

   b. A means of measuring (by thermometer or otherwise) the temperature of the fluid in the exhaust line of the sterilizer.

   c. A timer which automatically indicates the maintenance of a temperature of 250° F. in the exhaust line for a continuous period.

3. Elimination of the necessity to overload sterilizers by the provision of adequate sterilizer capacity (cubic feet of usable space, not number of sterilizers) to permit operation at no more than 85 per cent capacity during the normal working hours of the sterilizer attendants.

4. Periodic inspection of the sterilizers by a trained mechanic who understands the design and use of sterilizers, and who appreciates the importance of their proper maintenance. Many intelligent sterilizer attendants are forced to use defective equipment because of the opinionated ignorance of those charged with the maintenance of sterilizers and their source of steam.

5. Acceptance of the principle of gravity air clearance to assure complete penetration of the load by saturated steam.

6. Standardization of packaging in porous cloth wrappers (abandonment of metal containers).

7. Folding and arranging of supplies to facilitate the interchange of air and steam.

8. Packaging to insure complete penetration in a period permitting sterilization when exposed to saturated steam at 250° F. for thirty minutes.

9. Loading sterilizers so as to provide a horizontal path for the escape of air from all portions of the load.

10. Employment of permanent personnel, trained in proper packaging and loading, who realize their responsibility and perform their duties wholeheartedly.

11. Enforcement of a standard technique requiring a continuous exposure to saturated steam at 250° F. for thirty minutes as indicated by the temperature in the exhaust line.

DISCUSSION OF DATA

Fig. 1. The exposure necessary to destroy resistant spores in saturated steam depends upon the temperature of the steam. Raising the temperature markedly decreases the exposure required (2, 3).

Fig. 2. The destruction of bacterial life by heat is probably caused by the heat-denaturation of protein. Because proteins coagulate much more readily and at lower temperatures in the presence of moisture, sterilization is more easily accomplished by moist than by dry heat (15).

Fig. 3. Saturated steam is an ideal sterilizing agent for surgical dressings because it furnishes simultaneously the heat (latent energy of vaporization) and the moisture (water of condensation) essential for the destruction of bacterial life (11). The latent energy of 94 cubic feet of steam is required to heat 3 laparotomy kits (55 lb.) to sterilizing temperature. As this energy exchange occurs, 6.6 lb. of water are deposited throughout the fabric by condensation of the steam which has flowed into the kits.

Fig. 4. The bactericidal action of steam cannot be utilized until all the air is removed from the sterilizing chamber (9, 12, 22). Steam does not mix readily with air which protects unsterile material against contact with the steam. Because steam is lighter than air (Fig. 5), it stratifies over the heavier air as it is forced into the sterilizer and drives the air downward as effectively as if it were a piston. Thermocouples, located as indicated at 1, 2, and 3, record this action.

Fig. 5. As steam is forced into a closed chamber full of air, both steam and air are compressed as the pressure rises and become more dense. Throughout the compression the air (10) is approximately twice as heavy as the steam (18), does not mix readily with it, and stratifies at the bottom of the chamber (Figs. 4 and 10).

Fig. 6. The quantitative aspects of steam sterilization are illustrated by the fact that almost a liter of steam is required to heat a surgeon's glove to sterilizing temperature (865 c.cm. of steam for a size 7 glove weighing 13.6 gm.).

The collapse in volume (99 per cent shrinkage) which occurs during condensation results in the instantaneous development of local areas of negative pressure in the region where cold fabric is encountered. More steam, bearing its load of latent heat, rushes in to overcome the low pressure, contacts cold fabric, and in turn condenses. Thus, penetration by steam is a self-perpetuating process which continues as long as steam comes in contact with colder objects.

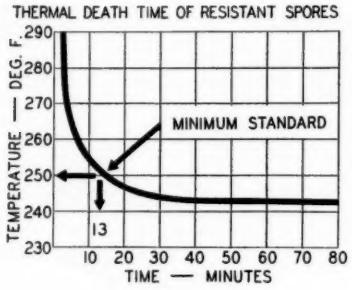


Fig. 1.

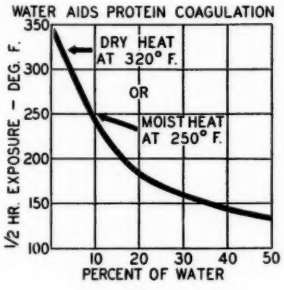


Fig. 2.

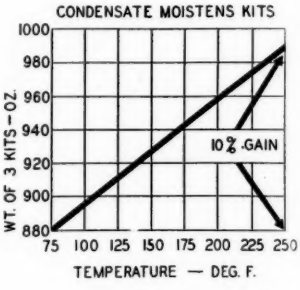


Fig. 3.

Fig. 7. Saturated steam has a characteristic temperature at any given pressure. When air is mixed with the steam, the temperature of the mixture is depressed markedly as indicated. If one-third of the air is removed from an autoclave, as by drawing a 10-in. vacuum prior to introducing steam under a pressure of 15 psi, the temperature of the mixture of residual air and steam is 223° F. (1) instead of 250° F., that characteristic of saturated steam under a pressure of 15 psi.

Fig. 8. Steam is an efficient heating agent because most of its energy (81 per cent at 250° F.) is in the form of latent heat. If air is introduced into the steam, this efficiency is markedly decreased (7) since the thermal capacity of air is low.

Fig. 9. Steam heats porous materials by actually flowing into them and liberating its latent energy.

The convection currents by which steam penetrates are created because of the difference in density (Fig. 5) between the steam and the air which it displaces from the interstices of the fabric. Once begun, convection is maintained by the collapse in volume which occurs when steam condenses (Fig. 6).

The power of steam penetration as compared with air and steam mixtures or hot air alone was determined by recording the time and temperature relationships in the center of identical 16 in. cubes of folded muslin. It took a mixture of air and steam nine hours to reach a maximum of 225° F.; hot air at 225 degrees heated the test bundle in twenty-four hours, while steam penetrated the cube in only four hours.

Fig. 10. The detrimental effect of air on steam sterilization is illustrated in terms of actual temperatures attained in an autoclave (unjacketed type containing 36 cu. ft.) into which saturated steam was admitted under a pressure of 15 psi. The air which initially filled the chamber was retained by closing the air exhaust line. Thermocouples (1, 2, 3), located as shown in Fig. 4, measured the temperature of the air and steam system at the respective levels indicated. The lighter, hotter steam (16.2 cu. ft.; density 0.073 lb./cu. ft.; temperature 240° F.) layered over the heavier, colder air (19.8 cu. ft.; density 0.136 lb./cu. ft.; temperature 130° F.) which was compressed into the lower half of the chamber.

Such a stratified system maintains itself indefinitely unless convection currents are established. In this experiment an electric fan was used to create a homogeneous mixture at 215 degrees. The fact that stratification recurred as soon as the fan was stopped is of great importance for sterilization because it illustrates that air and steam do not form a stable mixture. This explains why air can be removed from a sterilizer, yet, paradoxically, it remains trapped in an uncovered, upright container in the otherwise air-free chamber.

When the exhaust line was opened, the air was displaced by forcing steam into the sterilizer under pressure. The completeness of the air ejection is shown by the temperature at the bottom of the chamber which rose to 250 degrees and indicated that saturated steam under a pressure of 15 psi filled the entire chamber. The importance of providing a horizontal path for the downward escape of the air displaced by the inrushing steam and the reliability and effectiveness of gravity air clearance are well illustrated by this graph.

Surgical supplies are usually sterilized in steam-jacketed autoclaves, known as "dressing sterilizers," which differ from the simple, single-shell autoclave used here. Dressing sterilizers are designed so that steam under pressure can be admitted to the space between the jacket and the chamber wall to heat the latter to the temperature characteristic of the steam and thus to prevent condensation on the inner

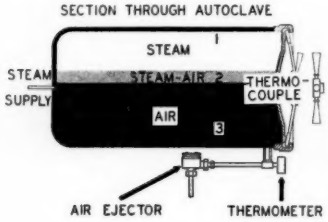


Fig. 4.

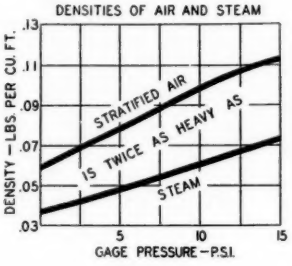


Fig. 5.

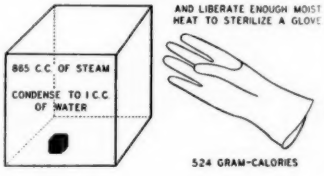


Fig. 6.

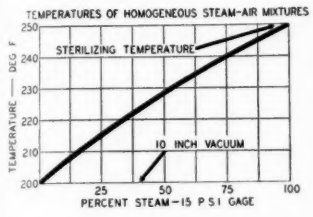


Fig. 7.

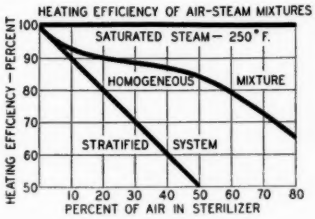


Fig. 8.

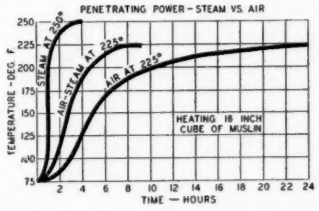

PENETRATING POWER - STEAM VS. AIR
STEAM AT 250°
AIR-STEAM AT 225°
AIR AT 225°
HEATING 18 INCH CUBE OF MUSLIN
TEMPERATURE - DEG. F.
TIME — HOURS

Fig. 9.

surface of the chamber. The hot jacket also aids in drying the load after sterilization has been completed. Temperature studies made in such a sterilizer are misleading because they may reflect the heating effect of the steam confined in the jacket rather than the heating efficiency of the steam within the chamber. Similarly, the fact that dressings are hot when they are removed from a dressing sterilizer does not mean that they are sterile. For example, a dressing sterilizer can be closed and steam turned into the jacket, but not into the chamber, which converts the sterilizer into a hot-air oven. The contents of the chamber eventually are heated to the temperature of the steam in the jacket, but that temperature is not lethal when hot air is used as the heat transfer agent. A comparable situation exists when steam is admitted into both jacket and chamber at a pressure of 15 psi, and the air is not permitted to escape. The air and steam mixture stratifies initially but soon becomes homogeneous as it is heated by the jacket. Ultimately it is superheated (56 degrees superheat; relative humidity 33 per cent) and becomes a slow-acting, unreliable bactericide.

Regardless of the type of steam sterilizer used, gravity air clearance is dependable because both the air and the air and steam mixtures discussed are heavier than saturated steam under similar pressure. (Densities: air at 250° F. and atmospheric pressure 0.057 lb. per cu. ft.; air and steam at 250° F. and 15 psi—0.1 lb. per cu. ft.; steam at atmospheric pressure—0.033; at 15 psi 0.072, respectively.)

Fig. 11. Steam displaces air from packages of dressings by a process similar to that illustrated in Figures 4 and 10. Thermocouples located at 1, 2, 3, 4 indicate in terms of temperature the composition of the air and steam mixtures at various levels inside of the chamber and within the bundle of dressings.

Fig. 12. The efficacy of gravity air clearance in removing the air, not only from the chamber but also from the load, is illustrated in this chart. One-third of the air was removed from the chamber by a 10-in. initial vacuum. Steam was then admitted under a pressure of 15 psi. The residual two-thirds of air was retained by closing the air exhaust line. The temperatures at the top of the chamber (1) (Fig. 11) and top of the bundle (2) rose as the light hot steam stratified at the top of the chamber and compressed the residual air downward. The temperatures of the bottom of the chamber (3) and bottom of the bundle (4) remained low because the cold air that was present prevented contact with the steam.

In this experiment spores in the top of the bundle would have been sterilized while those in the bottom would have escaped destruction because the air protected them from the steam. When the air was permitted to escape by opening the air ejector slightly, steam soon displaced the air, establishing sterilizing conditions throughout.

Despite the fact that one-third of the air was removed by drawing an initial vacuum of 10 in.—a widespread custom—the remaining two-thirds of the air prevented sterilization until it was permitted to escape by gravity. The fallacy of the custom is obvious as is the needless expense of creating the vacuum.

Fig. 13. Steam must have free access to packages to insure rapid, dependable sterilization. Metal containers limit the surface of the package exposed for the interchange of air and steam and may retard sterilization (14, 16, 20). This is illustrated by the heating curves of identical rolls of sheeting 6 by 17¾ in. in diameter. One was wrapped in four thicknesses of muslin; the other was enclosed in the conventional dressing drum. Both were placed in the sterilizer on edge. The perforations about the periphery of the drum were open. The chamber temperature rose to sterilizing level in twenty minutes. The muslin wrapped roll was penetrated in sixty-five minutes, while the roll in the dressing drum was not heated throughout for 175 minutes. The limitation of area available for the interchange of air and steam to the perforations about the periphery of the drum was responsible for the delayed penetration. Metal dressing drums are expensive, noisy, and cumbersome. They contribute little to aseptic technique and should be abandoned.

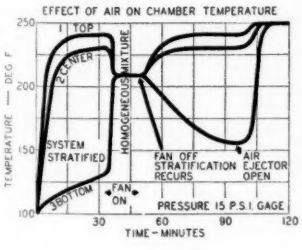


Fig. .

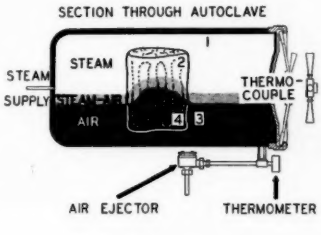
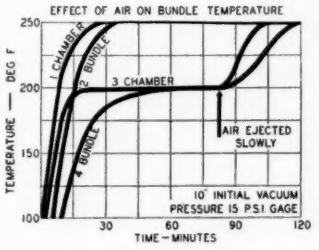


Fig. 11.



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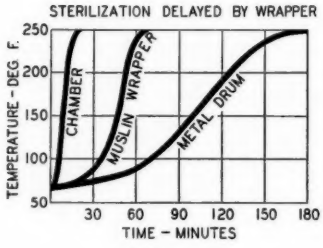

Fig. 13.

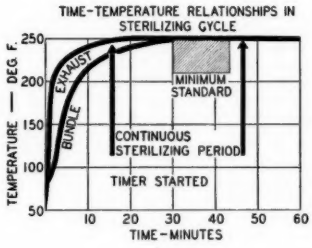

Fig. 14.

Fig. 14. The routine control of the process of steam sterilization of surgical dressings requires knowledge of four factors which influence the efficacy of the process:

1. The quality of the steam being used in the sterilizer must be determined. The temperature of the fluid in the exhaust line indicates whether air, steam, or a mixture of the two occupy the lower portion of the sterilizer. If the chamber pressure is 15 psi, the temperature in the exhaust line will rise to 250° F. when saturated steam has displaced the air and fills the chamber.

2. The period necessary for complete penetration of the largest bundle must be known. This can be controlled by establishing a standard size, shape, and internal arrangement for the largest bundle. A laparotomy kit weighing 18 lb. can be wrapped in a package 22 by 15 by 8½ in. in such a fashion that it will be heated throughout consistently fourteen minutes after the temperature in the exhaust line rises to 250° F. (Fig. 15).

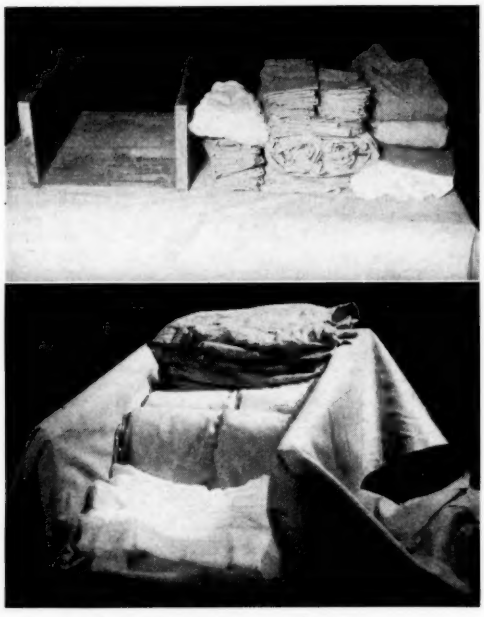

Fig. 15 a (top), b (bottom).

3. The sterilizer must be loaded to provide a horizontal path for the escape of air. The internal arrangement of the laparotomy bundle is such that air is displaced most readily when the package is placed in the sterilizer on its 22 by 8½ in. side. Care must be taken to leave a free space for the circulation of steam above and below each package.

4. The period of continuous exposure to saturated steam must be measured. Such exposure is essential because, as steam penetrates a package, it condenses on the thread of the fabric in quantities proportional to the heat required to raise such material to the temperature of the steam. The heating spreads centripetally in a distinct zone of demarcation; the temperature necessary for sterilization exists only where the goods are moist; a few centimeters in advance of the zone the fabric is dry and relatively cool. If this orderly heating is checked, the outer wet shell of moist fabric cools and must be reheated. If the outer one-third of the package cools to 212 degrees, 30 per cent more steam is required to reheat the outer wet shell (two-thirds of the package by weight) because the moisture left in the fabric by the initial heating (1.2 lb.) requires additional heat.

The temperature of the fluid in the exhaust line indicates the quality of the steam being used in the chamber (Fig. 11). When it rises to that characteristic of saturated steam under the pressure being used, all the air has been displaced from the chamber. In the large sterilizer used in this experiment the thermocouple located in the exhaust line indicated the presence of saturated steam (250° F.) in seventeen minutes. The thermocouple in the center of the bundle did not indicate complete penetration by steam until thirteen minutes later. As the size, shape, and internal arrangement of the laparotomy kit (18 lb.) has been standardized, the period necessary for penetration is uniform.

The sterilizing period can be measured, therefore, from the moment the pure steam fills the chamber. A period of thirty consecutive minutes provides for complete penetration of the load plus thirteen minutes for exposure of the least accessible area of the bundle to saturated steam at 250 degrees (Min. standard Fig. 3).

Fig. 15. Sterilization can be facilitated by packaging to insure penetration by steam in a uniform period. The general principles of packaging the supplies for a laparotomy are illustrated. The wooden trough (a) serves to limit the size and shape of the package. The wrapper consists of two sheets (63 by 90 in.) folded crosswise, which are draped to line the trough (b) as the first step in making the package. Supplies needed during the operation (sponges, abdominal packs, additional towels, final dressing) are placed in the bottom layer. The laparotomy sheet, suitably folded and rolled to afford easy draping as well as ready penetration of the center of the bundle, occupies the center of the second layer. This sheet, designed to cover the whole field from anesthetist's screen to patient's feet, is accordion

pleated from top and bottom toward the opening for the operative field. The pleated sheet is then rolled from either side toward the center to form relatively open parallel rolls. When properly located in the package, the sheet effectively divides the contents into four small sections which are easily sterilized. Towels for draping the skin are piled on top of the rolls; gowns for the team are arranged about this central pile to fill the space in the wooden trough.

Two ends of the folded sheets are brought across the top of the bundle and tucked into the crevice between the pile of supplies and the sheet lining the trough. The folded edge of the sheets is lapped over these thicknesses of sheeting. The other two ends are then overlapped to close the package against accidental contamination. The bundle is completed just as any paper wrapped package and secured by a library tie of Venetian-blind cord.

This package can be opened for operation by an unsterile nurse. Its contents are instantaneously accessible in the order in which they are required.

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IS STERILIZATION OF THE AIR BY THE USE OF ULTRAVIOLET RADIATION OF BENEFIT?

DERYL HART, M.D., F.A.C.S., Durham, North Carolina

IN attempting to answer the question as to whether or not sterilization of the air by the use of ultraviolet radiation is or is not of benefit, there are a number of questions to be considered.

1. What is the condition of the air, and if it is contaminated is it a universal or local condition?

2. What is the source of this contamination if present?

3. What can be done to reduce or eliminate this contamination?

4. Can the wound become infected from the bacteria floating in the air and falling into the wound?

5. What will ultraviolet radiation accomplish as regards bacteria on plates of culture media, and as regards bacteria floating in the air and dropping on plates of culture media; and what are the results obtained on patients insofar as postoperative wound infection is concerned and insofar as the postoperative elevation and duration of temperature elevation is concerned?

In regard to the degree of air contamination, this varies with the time of year and is further dependent on the number of occupants in the room and on the flora in the noses and throats of the occupants. It is higher during those parts of the year when the respiratory infections are predominant and diminishes during the times of year when the people are relatively free of such infections. Cultures in approximately 40 hospitals located over a wide area of the United States showed that pathogenic bacteria were present in the air in all operating rooms, and that the most common organism was the staphylococcus, the albus type being found most often, while the aureus, hemolytic and non-hemolytic, were not at all unusual, and at times there were as many as 50 colonies of the staphylococcus aureus sedimenting on a Petri dish within one hour's exposure.

It was found that the air-conditioned operating rooms had a much lower air contamination than those of the non-air-conditioned hospitals. This was caused, first, by an elimination of many or most of the non-pathogenic bacteria in the outside air and, second, by the washing out or reduction in the number of pathogenic organisms given off by the occupants of the room as a result of the more efficient ventilation. In our hospital we have found that the incoming air was practically sterile whereas cultures made above the roof of the hospital at the air intake and cultures made in the washing chamber before this air was washed and filtered showed many bacteria. Air in the ducts after it had been washed and filtered was practically free of organisms. Utilizing this clean air in large quantities for ventilation, we attempted to reduce the bacterial contamination in the operating room to a level where it would not be of danger to the patient. The reduction could be brought about quite rapidly as long as there were no occupants of the room, but as soon as it was occupied by an operating team the contamination could not be brought down to a level which we believed would be safe for an open wound. The air was cultured as it came into the operating room and was found to be practically sterile. The air above the hospital roof had gram-negative bacilli and fungi whereas the air leaving the operating room contained staphylococci predominantly.

Many other measures were taken to try to reduce the air contamination. The number of visitors was reduced to the minimum; the walls were washed daily and painted frequently; the floor was mopped with an antiseptic between operations; masks were worn at all times whether or not operations were in progress; for large operative procedures double masks of 8 thicknesses of butter gauze were worn; and large operative procedures were posted only as the first case in the morning after the room had been closed over night. It had been determined by sedimentation methods that the air which was contaminated to the extent of from 50 to 100 colonies sedimenting on a Petri dish per hour of exposure showed only 1 to 3 colonies per Petri dish per hour of exposure after the room had been closed for a period from twelve to twenty-four hours. Thus, in the early morning hours the air was practically free of sedimenting bacteria; however, as soon as the nurses entered the room the air contamination rose quite rapidly. This same rise, however, could not be obtained by the use of electric fans to stir up the

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dust on the floor. It was thought that this rise was due to a recontamination rather than a stirring-up of organisms which had settled to the floor. As noted above, the floor was washed frequently with antiseptic solutions to take care of any settling of dust. There was an average of 1 to 3 colonies sedimenting on a Petri dish when the room was quiet from 4 to 5 o'clock in the morning after the room had been closed overnight. The number of sedimenting colonies could not be raised above an average of 2 to 4 or 5 colonies with an electric fan blowing on the floor to stir up any bacteria which may have settled there.

By these various measures the air contamination was appreciably reduced but not to the level to give a satisfactory reduction in the number of postoperative wound infections. An attempt was made to eliminate carriers, both in the personnel and among the patients. Over a period of time the nose and throat of every patient was cultured before operation and every member of the operating-room personnel had his nose and throat cultured frequently. At one time we found that as many as 80 per cent of the personnel and 80 per cent of the general population had the staphylococcus aureus in their nose and/or throat so that it seemed impractical to eliminate every possible carrier. However, those who were known to be persistent carriers with a heavy contamination of their throats were not allowed to work in the operating room where large clean operations were performed.

The average mask is not satisfactory for eliminating the contamination of the air from the nose and throat. The criterion for a good mask should be that it could be used on as many people as ordinarily work in an operating room over several hours without an appreciable rise in the bacteria from this source.

We would answer the fourth question, "Do wounds become infected from these organisms floating in the air?" in the affirmative. Over several years' time we tested the air at frequent intervals, daily, for many months at a time. At times the organisms were cultured from the air before the wound showed evidence of infection and when this infection showed up the same organism was present. Our severe infections were caused almost exclusively by the hemolytic staphylococcus aureus. Furthermore, we found that when the air contamination with this organism was low we did not get wound infections, and when it became high, we had an appreciable number of infections with this organism. Our infection rate was approximately 4 per cent in clean primary incisions after we had taken all possible measures to reduce it. It is our opinion that during an epidemic of streptococcal sore throats the streptococcal wound infections would rise. This is well exemplified by conditions during the influenza epidemic during the World War when many operating rooms were closed except for emergency operations. Streptococcal sore throats were widespread and there were many streptococcal wound infections at that time.

Since all other measures for controlling the contamination failed or were only partially satisfactory, we turned to ultraviolet radiation as a method of destroying the bacteria after the air had become contaminated. This proved to be highly satisfactory by every test which we made. Using an intensity of radiation which with different installations varied from around 24 to 34 microwatts per sq. cm. at the operative site, and varying intensities throughout the other parts of the room, depending on the type of installation, we obtained uniformly satisfactory results. Bacteria, hemolytic staphylococcus aureus, on plates of blood agar, could be killed within one to two minutes' exposure at the operative site, and when Petri dishes were exposed at distances as far as 10 ft. from the source of radiation they could be practically sterilized within thirty minutes or less. Cultures made during operations by sedimentation of bacteria from the air on plates of blood agar showed that the number of colonies falling on a Petri dish at the operative site could be reduced from levels as high as from 100 to 150 to 1 to 3 colonies per Petri dish per hour of exposure. The Petri dish, of course, was exposed to continuous irradiation just as the sterile supplies are left exposed to continuous radiation, so the two are comparable. More viable bacteria may have dropped on the Petri dish and have been killed after falling on it but similarly viable organisms falling on the sterile supplies would also be killed. In other parts of the room the intensity of radiation was not so great and the reduction in the number of bacteria was correspondingly not so great. However, with the type of installation used most commonly the number of viable bacteria per Petri dish at the periphery of the room seldom exceeded 4 or 5 colonies per Petri dish per hour of exposure.

In regard to the results obtained on patients, there was an immediate cessation in serious infections. Before beginning the use of radiation there had been a number of deaths from wound infections in such cases as thoracoplasties, craniotomies, arthroplasties, and radical mastectomies. Since beginning the use of radiation, in a larger

series of operations, no patient operated on under the ultraviolet radiation has died of a wound infection. The infection rate has been reduced from an average of 4 per cent in clean primary incisions of small magnitude to considerably less than 1 per cent in the extensive operations when the radiation was used. In the latter group were all thoracoplasties, radical mastectomies, craniotomies, laminectomies, and arthroplasties. Some of these more extensive operations in the series without radiation had had an infection rate considerably higher than the 4 per cent general average. The postoperative temperature reactions of the patients operated on with radiation have also shown a marked improvement. The average duration of temperature elevation following operation for thoracoplasties, radical mastectomies, and inguinal herniorrhaphies showed an appreciable reduction throughout the entire year, but the reduction was directly proportional to the amount of air contamination, and at times was as great as 50 per cent when the air contamination was high; in the winter and spring months the greatest improvement was noted in the shortening of the postoperative temperature elevation. Likewise, the height to which the temperature went following operation was also reduced in direct proportion to the degree of contamination of the air. It is our impression that the improvement in this postoperative temperature reaction, with less soreness in the wound and improved healing, is probably of equal if not of more importance than the occasional elimination of infection.

We believe that ultraviolet radiation is the only satisfactory method of sterilizing the air that is available at the present time, and that by this method the air contamination can be reduced to a level where there is little risk of infection of the wound by the organisms present. There is some evidence that the organisms which are not killed may be attenuated by their exposure. In regard to the occasional infection in the wounds when radiation has been used, there has been an adequate explanation as to its source in almost every case. Most common of these infections has been a stitch abscess. This, of course, has most likely resulted from the fact that a stitch was left in for a sufficient period of time to permit the growth of skin organisms and to allow the reaction to take place.

THE PROBLEM OF CATGUT STERILITY

FRANK L. MELENEY, M.D., F.A.C.S., New York, New York

CATGUT is prepared from the intestines of sheep and is therefore grossly contaminated with intestinal bacteria. The most important of these are the spore-forming anaerobes, including the tetanus bacillus and the various species producing gas gangrene.

Spore-forming organisms are resistant both to heat and to chemical antiseptics. It is generally agreed that it is virtually impossible to destroy these organisms by any chemical substances without destroying at the same time some of the desirable physical properties of catgut. The only way to sterilize catgut safely is by some heating process, and if the heat is excessive or prolonged the desirable physical properties may likewise be destroyed. There is, however, a margin of safety in which heat sterilization of catgut may be accomplished and the catgut still retain its tensile strength, its pliability, and its absorbability.

In the past, certain firms manufacturing catgut sutures have tried to compromise on sterility in order to have their product stronger and more pliable. They have not subjected their product to adequate bacteriological tests in order to be sure of its sterility before putting it on the market.

In 1925, I had the opportunity of studying a case of fatal postoperative gas gangrene, which was 1 of 5 cases operated upon during a single week in one of the New York hospitals. All of the patients died of postoperative wound infection with gas-gangrene organisms. Specimens of catgut from the same lot which was used in these cases revealed the same organism which was recovered from the wound of the patient whom I studied, as well as several other pathogenic and non-pathogenic spore-forming anaerobic bacteria. This seemed to prove conclusively that the infection came from the catgut and that the catgut was not properly sterilized. Such a demonstration has been made on a number of other occasions.

Dr. Welch told me at the time that one of the reasons that Halsted turned to silk as a suture material was his belief that catgut sterility could not be depended upon.

From the Bacteriological Research Laboratory of the Department of Surgery of Columbia University and the Surgical Service of the Presbyterian Hospital.

This demonstration led me to undertake a study of the problem of catgut sterility and, with the aid of funds supplied by four of the principal firms manufacturing catgut sutures, a two-year study was made.

First we examined a large number of specimens of catgut purchased on the open market and found that 22 of 174 were contaminated. The products of 18 different firms were represented, 8 of which had put out unsterile catgut. These specimens came from 12 different surgical clinics in 11 different states of the Union. This indicated a fairly wide distribution of unsterile catgut, and the seriousness of the problem was obvious.

We also found that some firms were making no attempt to check the sterility of their product by anaerobic-culture technique. We, thereupon, worked out a test for sterility which would be adequate and could be readily applied not only by the manufacturers but by hospital laboratories. These studies were reported in 1931, and there immediately followed a renewal of interest and a greater effort on the part of the firms to put out a sterile product.

However, later studies by Clock and by Brewer and Brown, as well as tests performed by the Food and Drugs Administration, clearly showed that it was still possible to purchase unsterile catgut on the open market.

The American College of Surgeons and, later, the American Medical Association were asked to set up a control, but neither of these organizations was financially able to undertake such a control nor did they have the laboratory facilities to set up an adequate control.

An effort was then made to have some governmental agency, such as the Bureau of Standards or the National Institute of Health, undertake this control, but they likewise were not in a position to undertake it.

Finally, the whole subject of sterile surgical goods was considered by Congress and incorporated into the new Food and Drugs Act, which went into operation a year ago. Catgut is now legally recognized as a drug used for the treatment of disease and it must conform to the United States Pharmacopeia. During the past year an advisory committee on sterile surgical products has been working on the standards for these materials which have been incorporated in a supplement to the eleventh decennial revision of the U. S. Pharmacopeia.

These standards include passing the test for the sterility of catgut which we originally worked out with the addition of a few minor changes suggested by Clock to include more adequate controls. This Supplement was published on January 1st and will become effective on July 1st, as an official standard.

The Food and Drugs Administration is equipped with funds and with personnel to collect specimens from the open market all over the country and with a laboratory adequately equipped to test these products. Under the law it will then have the power to stop the further distribution of any unsterile catgut. We believe that this will result in the eventual elimination of unsterile catgut and the disappearance of those firms which are unwilling or not able to take the trouble to produce a dependable product.

ARE THERE SATISFACTORY CHEMICAL METHODS FOR THE STERILIZATION OF INSTRUMENTS?

E. E. ECKER, Ph.D., Cleveland, Ohio

IN the short time allotted to me for the discussion of chemical sterilization of instruments, I beg to call your attention to the great need for more consistent and reasonable methods for securing "sterility" in preoperative routine. I do not believe that I wander far afield when I suggest to you that the standardization of all procedures should be the aim of the College.

We sent 207 letters to leading hospitals in all sections of the country and received 106 replies.

From the Institute of Pathology and the University Hospital, Western Reserve University, Cleveland, Ohio.

Of these, 75 place their dull instruments in boiling water for periods ranging from ten to thirty minutes. Twenty-four hospitals autoclave their instruments at from 10 to 30 lb. with no mention of the temperature attained during sterilization, and 11 combine boiling and autoclaving. Three institutions boil their instruments in 1 to 2 per cent soda water. It was found that 49 hospitals boil their sharp instruments from five to thirty minutes. Ten heat their sharp instruments in oil at 250° F. and 18 autoclave them at 10 lb. (no temperature given) for ten minutes, while only 1 uses the hot-air oven at 170° C. for

sixty minutes. Eleven institutions use chemical solutions for from three to twenty minutes: 1 uses glycerolcresol, another glycerol and carbolic acid, 2 employ lysol and alcohol in a proportion of 1:12, and 10 use pure carbolic acid followed by rinses in alcohol for a period from three to thirty minutes.

Six institutions labor under the belief that alcohol sterilizes instruments and use concentrations of from 50 to 95 per cent; however, it is well known that anthrax spores survive all concentrations of alcohol for more than one hundred and ten days. This was known to Robert Koch in 1881. Absolute alcohol and alcohol in less than 50 per cent concentration are practically useless. Kuhn and Dombrowsky (1932) found sporulating organisms in more than half of the samples taken from alcohol (70 to 96 per cent) used in clinics and hospitals at Giessen. The futility of depending upon alcohol was well illustrated in the report of Nye and Mallory concerning an outbreak of clostridium-welchi infections following operations in which the instruments had been washed in hot soapy water, rinsed in scalding water, and immersed in 70 per cent alcohol.

Lysol is used in 2 institutions and 1 uses 5 per cent carbolic acid followed by an alcohol rinse. Six per cent employ pure lysol; 2, 20 per cent lysol; 1, biniodide of mercury; and 1, 70 per cent alcohol and soda soap.

Finally, 2 boil their instruments for three minutes and then immerse them in 10 per cent lysol.

It is a deplorable state of affairs and the same, although to a lesser degree, can be said of surgical dressings, rubber goods, and glassware.

Brewer recently stated that 71 per cent of dentists advocate chemical sterilization of instruments. Of these, 63 per cent employ a mercurial (metaphen, potassium, mercuriciodide, merax, mercresin, mercabolide or merthiolate); the majority (50 per cent) use metaphen in a 1:2500 dilution. The time of exposure varies greatly. However, they state that from ten to thirty minutes is a required minimum.

Brewer noted further that 12 per cent of the knife blades used in 120 surgical operations carried spore-bearing anaerobes. These results again emphasize the immediate necessity for a better understanding of the term "sterility" and "standardization" of procedures by reasonably fast and efficient methods.

Bacteriologically, the problem is not at all complicated. Sterilization can easily be accomplished by the employment of mixed, dried, and powdered garden soil which carries aerobic as well as anaerobic pathogenic spore-bearing organisms. According to Sobernheim and Muendel, finely powdered soil heated in streaming steam at 98 or 99° C. requires 6 to 8 times as long for complete sterilization as did a like number of spores derived from the same soil by culture. Spore suspensions prepared from soil and mixed sterile soil proved to be more resistant than culture spores similarly treated. Dried and powdered soil therefore offers a simple means of checking and standardizing technique in the hospital routine.

It was found that 1 gm. of soil per liter of water survived a boiling period of two hours, while 0.1 gm. of samples became sterile at the end of one hour and fifteen minutes. However, boiling of the soil in an alkaline 2 per cent soda water rendered it sterile in five minutes. When lubricated instruments were contaminated with powdered soil a period of ten minutes was necessary to complete sterilization. It was noted that the addition of formalin gave no advantage over the soda alone and formalin led to the liberation of irritating fumes.

Soda has been extensively used in Europe. Sobernheim reported that earth spores were readily destroyed by boiling in soda water for periods ranging from ten to twenty minutes. The same was advocated by Walbum at Copenhagen. Syringes, however, cannot be boiled in such alkaline solutions.

It was not possible to duplicate the work of Walbum with 0.5 per cent borax and 0.05 per cent hydrogen peroxide, and this applies particularly to the sterilization of lubricated instruments in less than one hour and forty-five minutes. A mixture of 1 gm. of soil to 450 c. cm. of 2 per cent cresol yielded growth after twenty-four hours of exposure provided the sediment was washed thoroughly prior to cultivation. This fact clearly demonstrates the ineffectiveness of cresol solutions. Most of these compounds (cresol solutions) have low phenol coefficients: 2–5. Commercial cresol also contains benzophenol, which is rapidly absorbed by human tissues and possesses great toxicity. Lysol fails to kill the spores of the anthrax bacillus or of clostridium botulinum. These solutions are effective against tuberculosis bacilli.

In our experience lindol (tricresyl-phosphate), which is employed for heat sterilization of instruments at from 170 to 175° C. and takes a period of 15 minutes, eventually breaks down and leaves a tarry deposit. If water is added a precipitate of cresols may form and phosphoric acid is liberated. The lindol then becomes most irritating.

Another common agent is potassium-mercuric-iodide. It is employed in a 1:5000 solution, a solution in which it is maximally ionized. In spite of this fact, it was noted that 86 of a total of 107 hand-brush jars were contaminated with various organisms including a pseudomonas (pyocyaneus). A curious fact was that the same solution killed this isolated strain of the organism. Upon further study it was learned that potassium-mercuric-iodide does not destroy the organisms attached to surfaces like those of rubber, glass, hair, gauze, paper, and wood. On silk or metal (Mitchel clips) they were killed. It was also found by conductivity measurements that the compound was highly dissociated in the 1:5000 solution, as generally used, and that the total number of HgI_2 ions per c. cm. was too small to destroy the organisms fixed on surfaces. Usually, organisms are attached to dust particles or cellular débris. With this fact in mind the surface tension of the solution was lowered in order to increase the number of HgI_2 ions in the surface films according to Gibbs adsorption equation. It was then discovered that the soap markedly increased the activity of the mercurial and that the same thing could be accomplished by increasing its concentration. However, even under these conditions it proved ineffective against organisms dried on wood.

Brewer recently pointed out that dental burrs and surgical blades are not sterilized by a large series of the newer mercurials, i.e., when these instruments are artificially contaminated with spores of pathogens. The spores were not even killed in the absence of proteins of body fluids. However, they are often inhibited in such a manner that they do not produce infections. It should be understood that Brewer employed large quantities of spores and in all probability in amounts out of all proportion to the total number of mercurial ions present per unit of the solution, as was found by us in the case of potassium-mercuric-iodide.

From these findings it must be assumed that the question of sterilization of surgical instruments by mercurials is not at all settled.

Another generally employed agent is formaldehyde gas. This gas has found considerable application in the sterilization of catheters and cystoscopes. However, unless the instruments are exposed for prolonged periods of time sterility cannot be expected. Penetration of the gas is often impeded by layers of muslin, and condensation of the gas readily occurs. Instruments contaminated by garden soil and exposed in the usual cystoscope boxes to the gas for thirty minutes showed growth. However, if the gas can be forced through by a 40 mm. reduction of pressure, sterility can be obtained in a short period of time (thirty minutes). This was accomplished in a modified pressure cooker in which 3 electrical heating units were inserted. A finely perforated disk separated the electrical elements from the main body of the tank. The evaporation of 1 tablet was found to be insufficient but 2 or 3 tablets induced sterility in about thirty minutes. When the pressure was not reduced organisms like the staphylococcus and colon bacillus survived exposure of the gas liberated from 2 or 3 tablets of formaldehyde tablets. Moisture on the instruments slightly improved the effectiveness of the gas.

The use of formaldehyde gas under partial vacuum has not received sufficient attention. Under ordinary conditions, however, long exposures, a high concentration of the gas, a high temperature, and a maximum degree of humidity are prerequisites for its effectiveness, but these factors are never considered in routine hospital technique.

Chlorine as a gas has never found much use because of its extreme irritation; generally, chlorine compounds lose a great part of their effectiveness in the presence of organic matter, and chloramine compounds are less active germicidal agents.

Recently, Hettche in Germany reported on the effectiveness of "quartamon," a chlorbenzylic compound of the higher alkylamids of dimethylamino-aceto-acetic acid. The compound has a pleasant odor and does not corrode. Hettche claimed that a 2 per cent solution sterilized instruments in about ten minutes. However, when organic materials were present it took one hour to accomplish sterilization, and soaps affect the compound. No work was done with pathogenic spore-bearing organisms.

Zephirol is another compound of this type with claims of effectiveness not only against the ordinary organisms but also against the spore-formers as well. It attacks rubber goods.

There are many of these agents on the market, namely, lavasteril, sagrotan, baktol, bacillol, chlorvarin, optiform; but little or no work exists to justify their general employment.

I wonder if we are really a long way from the days of the laudable pus and phenol sprays as far as our chemical sterilization technique is concerned.

Many of our agents are effective under laboratory conditions, but too often practically ineffective under other clinical conditions. The

phenol coefficient values as ordinarily determined are of little value in practice.

The ideal chemical should operate in the presence of organic matter; it should have a low toxicity, a low temperature coefficient, the power of penetration, a low surface tension, velocity of action, solubility, homogeneity, stability, detergent properties, and chemical compatibility, and should be non-corrosive, odorless, free from undue specificity, and low in cost.

The purpose of this discussion was to excite your interest in this matter and to beg you to consider a system of standardization of technique. At present we must rely entirely on heat for the accomplishment of "sterility," since there is only "sterility" and no "relative sterility."

CAN GERMICIDES BE RELIED UPON TO STERILIZE CUTTING-EDGED INSTRUMENTS?

EARLE H. SPAULDING, Ph.D., Philadelphia, Pennsylvania

THE summarized data presented by the writer has recently appeared in print (SURG., GYNEC. & OBST., 1939, 69, 738). A laboratory procedure with extremely contaminated knife blades was used to determine the bactericidal power of 7 representative solutions used for this purpose. Ethyl alcohol, phenol alcohol, soapy solutions of low surface tension, and heavy metal and formalin solutions were included. It became evident that even in the presence of blood and pus, knife blades could be rapidly sterilized by these solutions *provided no spores were present.*

The introduction of bacterial spores, however, changed the sterilization time from a matter of minutes, or even seconds, to one of several hours. In fact, only the solutions containing formalin succeeded in destroying tetanus spores within eighteen hours. Other types of spores were less resistant, but it was obvious that an overnight exposure in the germicide was required for safety. Even then only the formalin solutions were found to be satisfactory.

A number of germicidal solutions, not mentioned, have been investigated. None, however, has been found better than, or equal to, the formalin solutions.

A limited number of tests with hinged instruments have demonstrated that the sterilizing time is at least double that for knife blades.

It should be noted, however, that all these tests were conducted without previous cleaning of the instruments. Experimental data support the view that cleaning of instruments before immersion in germicide results in such a marked reduction in the sterilizing time that chemical sterilization of knife blades with certain germicides is both practical and efficient.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Glaser, M. A., and Blaine, E. S.: The Fate of Cranial Defects Secondary to Fracture and Surgery: A Follow-Up Study of 150 Patients. *Radiology*, 1940, 34: 671.

In order to prognosticate the fate of cases of cranial defects following trauma and surgery, 150 patients were studied by periodic cranial x-ray examinations. Careful attention was paid to duplication of the original x-ray technique for comparison. The medicolegal as well as the clinical value of such a study is apparent.

The healing of linear fractures depends upon the age of the patient, the width of the fracture line, and the location of the fracture in the skull. It is possible that a biochemical process occurs in some skull fractures similar to that which may be a factor in delayed or non-union of fractures of the long bones. The disappearance of linear fracture lines occurs much earlier in children than in adults. In a group of 8 children, fading of the fracture line became apparent within two months after injury and all but 1 of the fractures disappeared within six months. In adults, the earliest time for fading was within seven months, while the disappearance time was extremely variable. Fractures in the occipital region were much slower to disappear than those in other parts of the skull. Some occipital fractures were visible over an eight-year period. In 4 patients, instead of a healing, a widening of the fracture with absorption about the edges occurred. These were cases of extensive separation to begin with, although in some cases of wide separation healing occurred.

In a group of depressed fractures without operative elevation, the fragments fused in from ten to fourteen months. When the depressed fragments were removed by operation and a defect in the skull remained, the defect did not decrease in size but a rounding of the serrated edges occurred within eight months. If depressed fragments were replaced and the edges of the fragments were not approximated, or if bone dust was not used to fill up the spaces, x-ray evidence of separation was maintained up to five years. On palpation, however, the surface always felt as if solid bone were present.

For the operative replacement of depressed fragments the authors describe a catgut screen which they use to maintain the fragments in position. The introduction of silver plates was found to be extremely dangerous, whereas the use of osteoperiosteal grafts taken from the skull proved to be simple and most satisfactory for the closure of cranial defects. Complete calcification required a period of from five to eight years.

Osteoplastic bone flaps turned down for the removal of brain tumors or other intracranial lesions undergo various changes. In infants these wounds heal completely without signs of operative procedure. In adults the bone flap may appear normal, or it may undergo calcification within the center of the flap. The edges of the flap and the burr holes may disappear if the edges are closely approximated and bone dust is placed in the burr openings.

JOHN L. LINDQUIST, M.D.

Morrison, L. F., and Schindler, M.: Cavernous-Sinus Thrombosis: Report of Recovery Following Sulfapyridine Therapy. *Arch. Otolaryngol.*, 1940, 31: 948.

The authors report a recovery following thrombosis of the cavernous sinus.

Sulfapyridine was used as a chemotherapeutic agent; a total of 63 gm. (945 gr.) was administered. Excepting mild cyanosis, no subjective or objective reaction to the drug was observed.

The diagnosis of thrombosis of the cavernous sinus was made on both clinical and laboratory findings.

JAMES C. BRASWELL, M.D.

Lynch, D. F.: Osteomyelitis of the Jaws. *Am. J. Orthodont. & Oral Surg.*, 1940, 26: 584.

Osteomyelitis is usually caused by a mixed infection with the staphylococcus predominating. The resistance of the patient, the virulence of the invading organism, the traumatic injury, and the environment are factors in the development of osteomyelitis of the jaw. When congestion of the soft tissues of the jaw is not relieved, osteomyelitis may follow, especially when the congestion is in contact with bone for a period of time without drainage. A conservative method of treatment is indicated in most cases, although one must watch the case carefully for signs and symptoms of pus, within the mouth or without. It is often best to cut away tissue so as to create a gaping wound in order to insure free drainage and proper aeration. Drains should be allowed to remain long enough to accomplish their purpose. In osteomyelitis of the jaws, the process may be a simple one or it may extend and involve the whole jaw. When the teeth are loose enough to be an irritating factor, they should be sacrificed. Immobilization of the mandible is helpful.

A detailed report is given of a case in which there was a complete loss of structure involving the head of the condyle and in which the patient regained complete function and thorough use of his jaws. The entire ramus was lost and a new ramus was developed with all the anatomical landmarks in the roentgenographic plate. In this case the conserva-

tive type of treatment was followed, and after the sequestrum was removed, the jaws were wired into position so as to retain the normal relationship of the teeth. There was an extremely large amount of bone lost in this case. There has apparently been a regeneration of a new ramus with all the original anatomical characteristics, such as the angle, the mandibular canal, a sigmoid notch, and a mandibular sulcus. RICHARD J. BENNETT, JR., M.D.

EYE

Bair, H. L.: Some Fundamental Physiological Principles in Study of the Visual Field. *Arch. Ophth.*, 1940, 24: 10.

Study of the visual field is preferably classified as (1) topographic and (2) quantitative, the former dealing with the shape and extent of field defects and the latter with their density. Either may be achromatic or chromatic according to whether white or colored test stimuli, respectively, are employed. Field study in the presence of uncorrected ametropia and refractional aberrations is more reliable with the use of larger test stimuli and lower levels of adaptational, background brightness.

A new method of examination, depending on the use of a selected low level of adaptational, background brightness, is presented. This is more delicate and accurate than the ordinary method of examination at relatively high levels of light adaptation and minimizes certain technical difficulties in refined examination. No evidence is found for the belief that affection of the epithelial layers of the retina causes selective affection of blue perception whereas affection of the neural conducting system causes selective affection of red perception.

Shimkin, N. I.: Ophthalmic Injuries in War. *Brit. J. Ophth.*, 1940, 24: 265.

The present war has taken on the character of trench warfare. The experience of the World War showed that on the Western Front eye injuries increased two and even three times during the period of trench warfare in comparison with the preceding period of open warfare (Darier).

Trench warfare consists mainly of artillery activity which, directed against fortifications, inflicts wounds not only through fragments of bomb, shell, and shrapnel, but also by innumerable splinters of stones, cement, and sand. These splinters, "indirect projectiles," accompany every explosion and, having acquired great speed, cause injury to the globe of the eye no less dangerous than that of the shell fragments. However, according to my own observations, the most destructive agents of the visual organ are rifle and machine-gun bullets which cause mainly transpiercing wounds of the head, orbit, and of the eye itself.

The author gives the results of his observations of 238 cases of eye injuries at the Chief Casualty Clearing Station and over 593 cases in base hospitals. He describes some of them by means of histories of the injuries, and photos and drawings of those cases of eye injuries which are not seen in peace time. He discusses difficulties in diagnosis, treatment, and prognosis for the sake of those oculists who did not take part in the last World War.

He examines the character of the explosive action of bullets or other gun-shot missiles in wounding the orbit and stresses the enormous kinetic energy developed. He points out that the real destruction of the orbit and its contents is much more extensive than what is observed on examination of the external wound. All orbital wounds in which the missile passes over the arcus zygomaticus should be considered as cranial injuries. By these injuries the upper wall of the orbit, meninges, and the brain are wounded.

On the basis of numerous ophthalmoscopic and clinical observations he considers that concussion of the eye and brain is nothing but the disturbance of their vascular system. The severity of concussion is in direct proportion to this disturbance, which may result in varying degrees of degeneration of the nervous tissue of the retina and cortical visual centers.

Among 100 wounded there were 2.25 eye injuries and 20.4 injuries to the head. Rifle bullets gave two-thirds of all of the orbital and all of the eye injuries penetrating through and through. One-third of such wounds were inflicted by artillery fire. A patient suffering from an eye wound stayed in a hospital on an average of forty-six and eight-tenths days.

The eye injuries in the war are accompanied by dense adhesions of the sclera and the destroyed chorioid to the underlying tissue, which greatly increases the difficulty of enucleation of the globe; therefore the author suggests that such cases of eye injuries should be sent to a center where there is an oculist. The fear of sympathetic ophthalmitis is exaggerated; the author has seen only 1 case of sympathetic irritation which occurred on the twenty-sixth day after the patient had been wounded.

In 50 of 100 cases of eye injuries an eye had to be enucleated. Among 100 cases of eye injuries and concussion an average of 77 men lost the sight in one eye and 11.8 in both eyes. The present war threatens to produce a still greater number of blind than the last war, as in trench warfare the head, face, and hands are more often wounded than in "open warfare." LESLIE L. MCCOY, M.D.

Bothman, L.: Glaucoma Following Irradiation: Pathological Report. *Arch. Ophth.*, 1940, 23: 1198.

The case of a man aged sixty-two years, who had received large doses of roentgen rays and radium without adequate protection and who subsequently developed unilateral glaucoma, is reported in detail. Histological study showed thinning and destruction of the corneal epithelium and some damage to the endothelium, atrophy of the ciliary processes, and marked dispersion of pigment from the ciliary processes and posterior surface of the iris, with blocking of the spaces of Fontana and the anterior surface layer of the iris, which resulted in glaucoma.

Invasion of the sclera and choroid by a squamous-cell carcinoma was thought to have occurred late in the disease and not to be a factor in the production of the glaucoma.

The fact that the blood vessels were little changed from those of a patient of the same age with normal tension indicates that vascular changes played no rôle in the glaucoma. It is assumed that the pigmentary change noted was a direct result of the radiation. In the 3 previously recorded cases, similar alterations in the uveal pigment were noted.

WILLIAM A. MANN, M.D.

Brooks, W. D. W., Juler, F. A., and Williams, E. R.: The Relationship between Chronic Iridocyclitis and Tuberculosis, and the Appropriate Therapy. *Brit. J. Ophth.*, 1940, 24: 317.

The outstanding finding which emerges from the study of 40 cases of chronic iridocyclitis is that in a high proportion clinical and roentgenological evidence was found suggestive of the presence of tuberculosis elsewhere in the body.

The 40 cases in this series had in common a chronic ocular lesion, but otherwise they were unselected. The fact that 25 of them showed evidence suggestive of tuberculosis on clinical and roentgenological examination is therefore beyond the limits of coincidence, and strongly supports the view that chronic iridocyclitis is caused by tuberculosis. The authors are of the opinion, furthermore, that the very considerable difficulty in isolating the organism, not only in cases showing typical chronic pulmonary tuberculosis, but also in those in which widespread dissemination had occurred, is itself of the utmost significance in regard to the pathology of chronic iridocyclitis.

The authors are of the opinion that all these patients were particular examples of what may be called chronic disseminated tuberculosis, and that the occurrence of either parotitis or iridocyclitis, or both, is nothing more than an incidental feature of a generalized disease. The extent and severity of the disease would seem logically to depend on the number and virulence of the organisms discharged into the blood stream, and also upon the allergic condition and immunity of the patient at and after the time when dissemination occurs. In this group particularly, allergy was shown to be, as a rule, relatively low, while the clinical course indicated a very high degree of immunity. It is suggested that this finding, and also the difficulty of demonstrating the organism in spite of every endeavor, may be due in these cases to the fact that when dissemination occurs these organisms are already dead, or of such low virulence that local necrosis and caseation is found to be entirely absent or relatively slight in the metastatic lesions.

In these patients particularly the differential diagnosis includes Schurmann's disease and Boeck's sarcoid. In regard to the former (chronic miliary tuberculosis with lymphangitis reticularis), sufficient pathological evidence exists, and was indeed presented by Schurmann himself, to prove the tuberculosis etiology conclusively.

The latter syndrome was thought to be a localized form of tuberculosis. More or less widespread visceral lesions were shown to accompany the disease by Schurmann, and gradually an ill-defined group of disorders, including lupus pernio, lupus miliaris, angiolupoid, erythrodermia sarcoidique, cystoid formation in small bones, and uveoparotid fever, have been tentatively incorporated in the syndrome which is now known as sarcoidosis. It has become realized that sarcoidosis is a generalized disease of the reticulo-endothelial system, and that it affects particularly the lymph structures, the spleen, liver, skin, eyes, bones, lungs, salivary glands, and the central nervous system. Its outstanding features are those of a chronic recurrent toxemia, a low or complete insensitivity to tuberculin, an absence or paucity of caseation in the lesions which have otherwise a histological structure closely similar to that caused by tuberculosis, and, finally, the characteristic that tubercle bacilli cannot usually be demonstrated within the lesions.

While the cause of sarcoidosis cannot be said to be a matter of certainty, in the authors' opinion the available evidence suggests that the disorder is a manifestation of disseminated tuberculosis. The hypothesis that in these cases moribund or dead tubercle bacilli pass into the circulation and give rise to the generalized lesions would well explain the particular features of this disorder.

Consideration of the Mantoux reaction in the patients of this series is of especial interest when regard is paid to the dilution at which a positive result was obtained. It was noteworthy that when evidence of gross disseminated tuberculosis was present the Mantoux reaction tended to be either negative or positive only in the more concentrated solutions. This was true also in regard to the cases showing chronic pulmonary tuberculosis, for in these, widespread lesions were frequently associated with evidence of relatively low allergy, while sparse lesions often gave strong positive Mantoux reactions to the most dilute solution of tuberculin used.

In the group in which no clinical or roentgenological evidence of tuberculosis existed outside of the eye, the Mantoux reaction was, as a rule, strongly positive in the lower dilutions, which suggested that in these patients tuberculo-allergy was frequently high. Woods, Burke, and Friedenwald have recently shown that cutaneous sensitivity to tuberculin gives a fairly reliable index of the degree of ocular sensitivity, and, on this basis and in view of the reports of Rich and his associates at Johns Hopkins University that allergy and immunity are two distinct processes they have recommended that if tuberculin be used in the treatment of ocular tuberculosis it should be used with a view to desensitization rather than with a view to producing perifocal lesions which might themselves produce immune bodies. Our findings are in entire agreement with such a concept.

LESLIE L. MCCOY, M.D.

Terry, T. L.: Malignant Melanoma, So-Called Sarcoma, of the Uvea. Extension into the Optic Nerve. *Arch. Ophth.*, 1940, 24: 206.

Malignant melanoma does not involve the optic nerve frequently. Its relation to the optic nerve is of clinical importance, however, because the growth can extend along the nerve into the cranium. In a series of 94 cases of malignant melanoma the neoplasm had invaded the optic nerve in only 12 instances. It is the author's opinion that metastasis of malignant melanoma to the eye and especially to the optic nerve is rare and is present only when generalized metastasis has occurred, in which event the liver is likely to be involved. Malignant melanoma can reach the optic nerve by the following routes: (1) from the choroid by extension along the retina, (2) by direct extension into the optic nerve through the border tissue of the intra-ocular canal of the optic nerve, and (3) by metastasis. The neoplasm appears to grow toward the brain more readily along the nerve itself than along the intervaginal space and the meninges. Intracranial extension gives rise to increased intracranial pressure with a defect in the temporal field and later blindness of the uninvolved eye; it can be prevented by removal of a sufficiently long piece of nerve, which may include the interosseous and intracranial portions of the nerve.

Exenteration of orbital tissue must be done if there is any possibility that viable tumor cells have been spread through orbital tissue at the time of the original operation. JOSEPH K. NARAT, M.D.

EAR

Hughson, W.: A Summary of Round-Window Graft Operations Performed for Deafness. *Ann. Otol., Rhinol. & Laryngol.*, 1940, 49: 384.

Hughson briefly reviews the history and experimental background of round-window grafts in the surgical treatment of deafness. In a series of 35 carefully controlled cases he finds that infection has never occurred as a result of the approach to the round-window niche through wide incision of the tympanic membrane. The round-window membrane has not been ruptured, as evidenced by complete absence of any postoperative vestibular symptoms. During the period of direct observation, possible only with magnified binocular vision and brilliant illumination, the graft has never failed to remain fixed in the round-window niche. This represents an interval well beyond the time when normal tissue grafts might have failed to take, and slough from their newly applied position.

Improvement in hearing fulfilling desirable standards has been obtained following round-window graft operations. The series has been small, but has extended over a period of three and a half years. When cases are selected according to the criteria which the author enumerates, and when the surgical procedure is carried out as described, the operation is devoid of any serious immediate risk, and in no instance has there been any late complication. The applicability of the procedure apparently is limited only in the age group above fifty years, and in cases in which hearing losses are greater than 50 decibels in the speech frequency range. It is hoped that the scope of the operation may be extended to the age group in the second decade, after the hearing loss has reached a relatively static level.

NOAH D. FABRICANT, M.D.

McCaskey, C. H.: Pseudoxanthomatous Tumor of the Mastoid: A Résumé of Lipoidoses. *Arch. Otolaryngol.*, 1940, 31: 938.

The author describes a condition appearing as a hemangioblastoma with pseudoxanthomatous change and discusses briefly the present-day knowledge concerning the various lipoidoses.

A case in which a tentative diagnosis of hemangioblastoma with pseudoxanthomatous change was made is reported.

The pathological observations in the reported case are compared with those of reliable authorities.

It is noted that surgical removal of such growths often proves difficult or impossible.

Consideration of the literature concerning xanthomatous pathology prompts a review of the "lipoidoses," a suitable term because all the conditions falling into this group have some underlying disturbance of lipoid metabolism.

Xanthoma tuberosum is described as a form of localized lipoidosis and its causative factors are stressed.

Xanthomatosis is a more common form of generalized lipoidosis. As to its cause, perhaps the best one can do is to hypothesize that a lipoid imbalance between certain cells and the blood stream or a disturbance in lipoid metabolism, either local or general, accounts for the characteristic pathological condition. JAMES C. BRASWELL, M.D.

NOSE AND SINUSES

Frank, I., and Blahd, M.: Pyogenic Granuloma of the Nasal Fossa. *Arch. Otolaryngol.*, 1940, 31: 919.

The authors have based their studies on the examination of so-called bleeding polyps of the nasal fossa, in an effort to determine whether these growths are non-specific edematous polyps associated with dilatation of the vessels, secondary hemorrhage, and fibro-angiomas, or whether they may be classified as pyogenic granulomas. As far as the literature is concerned, no general agreement as to their nature has been reached.

The prominent inflammatory features of these polyps in the presence of extensive vascularity brings to mind the granuloma pyogenicum, a structure well known to the dermatologist.

The clinical similarity of these lesions is striking. Their growth is rapid and often painless. Hemorrhage is a usual symptom, and bleeding occurs on the slightest contact. Purulent discharge is frequent with both types, and recurrence after removal

is likewise a factor common to both. Lesions of both types vary from 0.3 to 2 cm. in diameter. They are bright red, blue-red, or brownish red. Both are frequently eroded and may be sessile or pedunculated.

The incidence of bleeding polyps of the nasal fossa resembles that of granuloma pyogenicum. Either lesion may occur in all age groups. It has been stated that bleeding polyps of the nasal fossa have a predilection for females. However, in a series of cases chosen at random from the literature, the division is approximately equal between the sexes.

Histologically, the lesions in all 5 of the authors' cases were identical with bleeding polyps of the nasal fossa (most of which were diagnosed as nasal fibrovascular tumors), as well as with pyogenic granulomas, both of which have been reported in the literature. The granuloma pyogenicum is a structure usually bordered by a layer of epithelium. It is superficially ulcerated in about one-half of the cases, and consists of young connective tissue and young blood vessels. The blood vessels may be so large and numerous as to suggest an angioma. The inflammatory reaction, which consists of infiltration of polymorphonuclear leucocytes and mononuclears, is not invariably present.

Therefore, bleeding polyps should not be classified as fibrovascular tumors even though their blood vessels present an angiomatous appearance and they do not show diffuse inflammatory infiltration. Apparently, they are pyogenic granulomas.

In view of all that has just been said, it is recommended that the term "bleeding polyp of the nasal fossa" be discarded. It is inexact and categorical, and refers merely to a symptom rather than to the type of underlying lesion. The evidence discussed in this study makes it seem probable that many an easily bleeding, painless, rapidly growing polyp of the nasal fossa, composed of young connective tissue and blood vessels, with or without infiltration of inflammatory cells, is a pyogenic granuloma. JOHN F. DELPH, M.D.

MOUTH

Rigg, J. P., and Waldapfel, R.: Lymphangiomas of the Tongue. *Arch. Otolaryngol.*, 1940, 31: 966.

The origin and pathogenesis of lymphangioma of the tongue is suggested by a study of 2 patients with this condition. In one case a diffuse lymphangioma could be traced to early youth. In the other case two separate areas of lymphangioma without communication are described. Microscopic examination showed no evidence of trauma or inflammation. A congenital origin appeared to be the most likely explanation for the origin of these tumors.

The occurrence of two separate lymphangiomas on the same tongue is of interest concerning the favorite site for the development of this tumor. In the embryo the tongue develops in the third week from an anterior anlage coming from the mandibular arch, from bilateral thickenings, and from a posterior paired anlage from both hyoid arches. The line of fusion between the anterior and the posterior anlage is marked in the adult by a V-shaped furrow along the line of the circumvallate papillæ, in the apex of which lies the foramen cecum. It is interesting that both lymphangiomas of the same tongue were lying within the limits of fissures in the embryonal development. The large main lymphangioma was limited medially by the central line of fusion between the two thickenings of the anterior anlage and posteriorly by the embryonal fissure between the anterior and the posterior anlage of the tongue. While it spread slowly against the latter, the mass ended sharply at the former with overhanging walls. The same was true of the small mass on the inferior surface of the tongue. It also originated from the central line of the tongue, but remained smaller and did not extend farther posteriorly. It is assumed that there is some developmental arrest along the border of the embryonal tissue of the arches and that sometime during life this tissue takes on the peculiar lymph-vessel change and forms lymphangiomas which are specifically confined within definite boundaries. This observation of a double lymphangioma on the same tongue significantly supports the theory of the fissural development of lymphangiomas and of their embryonal origin.

The lymphangiomatous tissue substitutes for the normal lingual tissue. The enlargement of the affected areas of the tongue, the macroglossia, is not brought about by hypertrophy of the lingual muscle fibers but by augmentation and dilatation of the cavernous lacunas.

The lacunas in the cases described are filled partially with lymph and partially with blood so that the name "hemolymphangioma" would be justified. The cavities were histologically, almost without exception, dilated lymph vessels, and those which were filled with blood did not look different from the others.

The diagnosis of these tumors is confirmed or supported by the macroscopic picture of the "blisters" and the microscopic picture of the lacunas. In the differential diagnosis sometimes a malignant tumor might be considered, but such a growth is easily differentiated from lymphangioma by the history, the course, and the histological examination.

The prognosis is usually good; however, the frequent injuries to which the enlarged tongue is exposed cause a permanent danger of infection, and even with apparent freedom from symptoms, treatment is advisable.

The therapy of choice is radical excision if one is dealing with small, circumscribed tumors. With extensive, diffuse tumors the entire mass cannot be removed, but it is possible, by a combination of several excisions of wedge-shaped sections of tissue in different directions, to reduce the tongue so much that it has space in the oral cavity. Ignipuncture and radium therapy for such tumors have not proved as

successful as they have for those of the blood-vessel type. MANUEL E. LICHTENSTEIN, M.D.

NECK

Smith, J. E.: Retropharyngeal Abscess with Reference to an Abnormally Large Percentage of Cases. *Ann. Otol., Rhinol. & Laryngol.*, 1940, 49: 490.

The high mortality rate of retropharyngeal abscess is appalling. Many of the cases reported in hospital records are tonsillar or peritonsillar abscesses; that is, their cause and anatomy have to do directly with tonsillar and peritonsillar tissue as differentiated from retropharyngeal tissue.

Twenty cases of retropharyngeal abscess, with a mortality rate of 30 per cent, are reported in patients whose ages varied from eight months to sixty years. The occurrence of the abscess was practically the same in both sexes, there being 11 males and 9 females (13 children and 7 adults). Death occurred in the cases of 3 children and 3 adults.

The pathology, complications, and treatment of retropharyngeal abscess are the same in both adults and children; however, there is often a difference in its cause, particularly with relation to tuberculosis and foreign bodies. Retropharyngeal abscess is much more prevalent in children than in adults. Head colds, rhinitis, sinusitis, nasopharyngitis, otitis media, Waldeyer's ring, with lymphatic drainage into the deep cervical and retropharyngeal lymph nodes, are predisposing factors. Still another cause is the marked nasal blockage brought about by hypertrophied adenoid tissue. Many cases of retropharyngeal abscess of otitic origin have been reported, and, in children, upper respiratory infection is usually present. In the adult, tuberculosis must first be considered as a causative factor.

In the child, the symptomatic condition should be thought of somewhat differently than in the adult. In the adult, the symptoms and signs all point to the cervical region; in the child, who does not complain so quickly, the symptoms may be very misleading.

In children, most cases are complicated by acute infections of the upper respiratory tract and the onset may be insidious. There may or may not be an elevation of temperature; there may be a croupy cough and some interference with breathing and swallowing, especially in a nursing child. The evidence of nasal obstruction, if the abscess is located high, and of regurgitation through the nose, dysphagia, odynphagia, dyspnea, a "quacky" cry or altered voice, stertorous breathing, and retraction of the head when the abscess is situated low, are danger signs. Inanition, anorexia, and rapid loss of weight due to the lack of food, may be present. Pain, if any, is deep-seated. There is usually swelling of the glands of the neck on one side or the other; the child may have convulsions, facial nerve paralysis, or suppurative otitis media. If there is any impending dyspnea, the head is often thrown back on inspiration and a marked wheeze is present. There may be obstructive laryngeal dyspnea. When bloody mouth secretions are present in a child, retropharyngeal abscess should be suspected.

In the adult the symptoms, signs, and complaints point directly to a pharyngeal condition. The onset is similar to that of quinsy, from which it must be differentiated. The smooth, tense, rounded elevation with fluctuation back of the pharyngeal wall, is proof of the abscess. Generally, the condition takes from a week to ten days to develop, although it has been observed after as short an interval as four days from the onset.

Diagnosis is dependent largely upon the history, signs, symptoms, x-rays, and the exploratory needle. Usually no difficulty is experienced in making the diagnosis once the symptoms and signs are manifested; it is the complicated and overlooked cases that lead to diagnostic difficulties.

In the well defined, easily diagnosed case in which prompt incision and drainage has been performed, the prognosis is good. However, when one examines the complicated cases the high mortality is astounding. The death rate, particularly in the tuberculous type of abscess, is high. Hemorrhage complicating retropharyngeal abscess should be treated by immediate ligation of the external or the common carotid artery, or of the jugular vein. In the author's series there were 2 cases of severe hemorrhage, both fatal. Another complication is spontaneous rupture with suffocation. There were 2 such cases in this series.

The treatment of retropharyngeal abscess is surgical, regardless of whether the condition is primary or secondary, except in the presence of gumma. As a rule, the opening should be intra-oral; however, in the case of a tuberculous abscess, an external opening should always be made, and the abscess should be treated like tuberculous abscesses in other parts of the body, but with much greater conservatism. As to the external operation, the route either in front of, or posterior to, the sternomastoid may be taken. For the internal route, the prone position with the use of suction is preferred. No general anesthetic is used.

In the early or pre-abscess stages, heat to the neck, moist compresses, warm or hot gargles to promote hyperemia, and short-wave diathermy treatments are beneficial. Supportive measures should be instituted. Proper local treatment to the nose and throat should be administered, and suction should be used if accumulated mucus cannot be removed. JOHN F. DELPH, M.D.

Puppel, I. D., Klassen, K. P., and Curtis, G. M.: The Calcium Metabolism in Thyroid Disease. *Western J. Surg., Obst., & Gynec.*, 1940, 48: 374.

The authors ran a series of experiments on calcium balance in normal persons and in those suffering from thyroid disease.

Three normal persons were maintained on a low calcium intake for thirty days and each developed a negative calcium balance. The authors concluded

that normal persons excrete a certain amount of calcium daily regardless of the intake of calcium.

Two patients with non-toxic nodular goiter who were maintained on a low intake of calcium showed a negative calcium balance similar to that of the normal controls. Four patients with exophthalmic goiter who were maintained on a relatively low calcium intake had a great increase in the excretion of calcium both through the urinary and gastrointestinal tract. An increased negative calcium balance of from seven to eight times the normal was established. The blood calcium and phosphorus almost invariably remained within the normal limits. These did not simulate the characteristic features of the disturbed calcium metabolism of the usual case of hyperparathyroidism. Feeding an increased amount of iodine to these patients did not produce any appreciable change in the calcium excretion.

The increased feeding of calcium to a patient with hyperthyroidism in similar amounts as for a normal person produced immediate tremendous retention of calcium of ten times the normal quantity and a consequent positive calcium balance was established.

A striking feature of the authors' series of investigations is the definite decrease in the excretion of calcium in cases of toxic nodular goiter when compared to that of cases of exophthalmic goiter. This difference remained even in patients with comparatively similar basal metabolic rates.

EARL O. LATIMER, M.D.

Ganem, J. F.: The Iodine Test in the Diagnosis of Doubtful Hyperthyroidism (El test del iodo en el diagnóstico del hipertiroidismo dudoso). *Rev. méd. d. Rosario*, 1940, 30: 569.

The author briefly reviews the historical development of iodine therapy in hyperthyroidism. He credits Rilliet with establishing iodine therapy in the treatment of hyperthyroidism in 1860. In 1863, Trousseau erroneously gave a patient tincture of iodine instead of tincture of digitalis with remarkable improvement following such treatment. He was the first to describe the effects of iodine on toxic goiter. In the early part of the present century, Kocher demonstrated the dangers of iodine therapy. Since that time advocates have published statistics to prove that the administration of iodine to patients with hyperthyroidism reduces the metabolic rate immediately and alleviates all clinical symptoms except exophthalmos and goiter.

The author studied 15 patients with some clinical evidence of hyperthyroidism and increased metabolism but in whom the diagnosis of hyperthyroidism was not certain. These cases are reported in detail. Most of the patients were ambulatory but a few were in bed. They were given Lugol's solution, the American formula. A reduction of 15 points in the metabolic rate, the standard established by Means, was considered a positive test. Twelve of the cases gave a positive reaction, and thus confirmed the diagnosis of hyperthyroidism. One case, which gave a negative reaction, was later identified as a case of hyperthyroidism. The 2 other cases with negative results proved later to be Parkinson's syndrome and nodular goiter without hyperfunction, respectively. Thus, the corrected percentage of positive results was 92.3 per cent.

The author concludes that the iodine test, which is easy to perform, is of great diagnostic as well as of therapeutic value in doubtful cases of hyperthyroidism. MICHAEL DEBAKEY, M.D.

Wyndham, N.: Liver Damage in Thyrotoxicosis. *Australian & New Zealand J. Surg.*, 1940, 9: 385.

The author made post-mortem studies of the liver changes that occurred in 43 patients who died of thyrotoxicosis. All of the patients were adult females. In 10 the liver weighed less than 1,000 gm. In only 6 did it weigh 1,300 gm. or more. There was no relationship between the liver damage and the size of the liver. In nearly every case examined the patient died of a fulminating type of thyrotoxicosis.

In 13 of the specimens the histological findings were only those of passive congestion. There were 10 instances of fatty changes in the liver cells without liver atrophy. There was a great variation in the degree of fatty change. The author could find no correlation between the length and severity of the toxicosis and the degree of fatty change.

In 6 cases there were findings suggestive of early cirrhosis, such as an increased amount of connective tissue in the portal canals, patchy lymphocytic infiltration, areas of regeneration of the liver cells, and occasionally minor degrees of liver atrophy.

In 8 cases there were fatty changes with atrophy, the fatty changes usually being pronounced. In only 2 cases was the atrophy evident on gross examination. In 2 of the 8 cases there was some clinical evidence of liver damage. It should be stated that 1 of these 2 cases was complicated by pregnancy.

The author concludes from his study that the association of thyrotoxicosis and liver damage is less constant than one might deduct from reports based on experimental findings. EARL O. LATIMER, M.D.

Maxwell, J. H.: Stenosis of the Larynx Due to Paralysis of the Vocal Cords. Treatment by Submucous Resection of the Vocal Cords. Report of Operated Cases. *Laryngoscope*, 1940, 50: 452.

Stenosis of the larynx due to paralysis of the vocal cords has long challenged surgical ingenuity. At intervals tracheotomy has been supplanted by some plastic procedure designed to produce a more satisfactory end-result. A continuous effort has been made to achieve the two prime requisites for satisfactory relief from this condition. A retention of the natural airway and preservation of the voice have been one or both objectives of those laryngologists who have proposed new treatments.

Not all cases of bilateral paralysis of the vocal cords require the surgical reëstablishment of an air-

way. Nor is aphonia the inevitable symptom of such paralysis. The disability produced by such paralyses depends upon the position assumed by the paralyzed cord. It is important to realize that the position of a paralyzed vocal cord due to recurrent laryngeal nerve injury may change. This likelihood of shift of a vocal cord from the cadaveric to the median position following an insult to the recurrent nerve prompts the laryngologist to keep under closer observation the individual who is moderately inconvenienced with both cords fixed in the cadaveric position. Because of the possibility of these cords returning to the median line, the patient is a potential candidate for surgical relief from an impending dyspnea. The surgical therapy of the condition must be individualized, for it can scarcely be said that every patient with bilateral paralysis of the vocal cords can be adapted to one routine standard surgical operation.

In the past ten years at the University of Michigan Hospital clinic, there have been recorded 29 cases of bilateral abductor paralysis of the larynx. It was found that the largest number of cases was associated with thyroidectomy. In this series there were 2 instances in which an incomplete paralysis was associated with thyroid enlargement. In nearly 50 per cent of these cases the paralysis of the vocal cords was found to have developed on the basis of a central lesion.

The majority of these patients had incomplete paralysis or apparently complete paralysis, with the vocal cords lying in the cadaveric position, so that an adequate minimum airway was maintained and surgical treatment not required. In 4 cases following thyroidectomy the paralysis was temporary. In 3 cases of bilateral recurrent laryngeal nerve paralysis following thyroidectomy, an adequate minimum airway was present for nine months, six years, and seventeen years, respectively, before an embarrassing dyspnea developed. At the time of examination of each of the 3 patients both cords were fixed in the midline. In 5 instances of laryngeal stenosis associated with bilateral abductor paralysis of the vocal cords, a submucous resection of the larynx was performed. The operation used in 4 of the cases varied in technique from that described by Hoover in two essentials: (1) the arytenoid cartilage was completely removed along with the process muscularis in an effort to widen the glottic chink; and (2) a two-way tube was placed in the larynx following the laryngofissure and left in place from one to three months. NOAH D. FABRICANT, M.D

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Sorgo, W.: The Diagnosis and Operative Indications of Intracranial Hemorrhage (Die Erkennung und operative Indikationsstellung bei den intrakraniellen Blutungen). *Wien. klin. Wchnschr.*, 1940, 1: 105.

Extradural hematoma resulting from a rupture of the middle meningeal artery or its branches presents an extended and well known clinical picture. In contrast to the other forms of intracranial bleeding, namely subdural, subarachnoid, intracerebral, and intraventricular hematomas, it is much less thoroughly discussed in the German literature. The prognosis of extradural hematoma is favorable when the condition is recognized in time and treated properly. Complications such as severe brain contusion, skull fracture with the danger of meningitis, or pneumonia associated with prolonged unconsciousness may bring about a fatal outcome. Subdural hematomas are located between the dura and arachnoid. There are several forms and it is not clear whether or not there is a single causative factor. The pathologists speak of a pachymeningitis hemorrhagica interna but there are several other names for the condition in use. Subdural hematoma occurs in from 8 to 14 per cent of all skull injuries, and it is noteworthy that slight trauma is often reported as the inciting cause of the condition. In the strictly traumatic cases it usually results from a tearing of the veins between the cerebral veins and the superior longitudinal sinus. In numerous instances, however, these veins are not the source of the bleeding. The extravasated blood mass becomes organized and in the course of organization an enveloping membrane forms around it. Smaller hemorrhages may be absorbed entirely. The clinical course depends upon the ability of the brain or skull to accommodate the mass, the power of resorption, and the extent of the brain swelling. Symptoms of increased intracranial pressure usually bring the patient to the doctor. Often slight paresis of the face or extremities is apparent. Papilledema is absent in about half of the cases.

In the absence of a history of trauma the diagnosis is difficult. Brain tumors, as a rule, give a longer history, except that in brain abscess or multiform malignant glioblastomas the history may likewise be short. In these two conditions, however, the patient is usually more acutely ill and the disturbance of consciousness due to the presence of the tumor suggests a tumor-psychosis. Other conditions which must be differentiated include fat and thrombotic embolism, meningitis, and cerebral apoplexy. Idiopathic forms of subdural hematoma run a different course; they may occur in old, institutionalized alcoholics. Lumbar puncture does not have much diagnostic value, whereas arteriography helps considerably in the recognition of the condition. Ventriculography reveals a typical but less convincing picture than arteriography.

Treatment consists of evacuating the hematoma. The removal of the entire hematoma including the membrane has been abandoned since such a procedure may result in tearing of vessels leading to the dura and fresh hemorrhage. In the event that arteriography has not been performed and the possibility of a bilateral hematoma has not been excluded, both sides of the skull should be trephined since the prognosis in these cases is very poor with unilateral evacuation. Toennis lost 2 of 20 and Kohlemann 4 of 24 operative cases. In subdural hematoma of the newborn results have not improved either with Cushing's operative treatment or with the less radical aspiration treatment, so that the prognosis on the whole is very unfavorable.

Subarachnoidal hematoma results from hemorrhage into the external cerebrospinal fluid spaces. These hematomas lie within a sac made up of pia on the one side and arachnoid on the other. In the majority of cases these hemorrhages arise in arterial aneurysms of various types, especially congenital arteriovenous aneurysms and angiomatous formations in the brain. Under the influence of a change in the blood pressure relationships during puberty spontaneous rupture of these vessels may take place.

Other conditions which raise the blood pressure and may result in spontaneous rupture are alcoholic excess, coitus, and heavy lifting. Especially significant are subarachnoid hemorrhages resulting from trauma to the larger vessels, such as injury to the internal carotid artery by bone splinters, which in the exceptional case may lead to traumatic arteriovenous aneurysm of the internal carotid artery with pulsating exophthalmos. With the onset of a profuse hemorrhage a patient in full health may be stricken very suddenly, but often preceding this event definite prodromal symptoms occur which make a diagnosis of the underlying lesion possible. A knowledge of the symptomatology of this clinical picture before and after the onset of hemorrhage is of great importance. In the majority of cases the lesion is an angioma of the brain. Early recognition alone permits successful treatment, which is feasible only when the tumor is small and its vascular supply remains within normal limits.

Significant insofar as practically proving the presence of congenital arteriovenous aneurysm is the syndrome of subarachnoidal hemorrhage, with epileptic seizures and transitory paralysis. Through arteriography we have a means of diagnosing this condition with certainty and of being able to determine the extent of the lesion. In order that the treatment be successful it must be directed to the lesion itself.

In the event of acute hemorrhage absolute bed rest must be maintained which as a rule stops the hemorrhage. Extirpation of the angioma is the treatment of choice and gives good results. If radical removal is not feasible because of the situation and size of the lesion, ligation of the common carotid artery and later of the internal carotid artery will bring about improvement. X-ray therapy has no effect. The most frequent intracerebral hemorrhage is the apoplectic type principally in the internal capsule. Because of the frequency of extensive damage to the brain substance surgical treatment has little to offer even theoretically; in addition these patients are poor risks usually because of their age and their poor condition. In spite of this a few authors have obtained good results with surgical procedures. Schoenbauer had 5 cases in 4 patients in whom, to be sure, the apopletic nature of the disease was not entirely clear.

Intraventricular hemorrhage results most often from rupture of one of the larger intracerebral vessels rather than of a vessel of the plexus. The extravasated blood is driven by the arterial pressure into the external or internal fluid spaces. The latter event has long been held to mean certain death. However, observations in the past year have shown the contrary. These cases do not present any indications for operation.

In conclusion, the management of intracranial hemorrhage comprises a rather large field of neurosurgical activity. The prerequisite for a successful outcome is a correct and timely diagnosis. Arteriography is of first importance and ventriculography is indispensable as an aid to diagnosis.

(Bode). John L. Lindquist, M.D.

Short, A. R., and Dunster, M.: Traumatic Extradural Hemorrhage. *Brit. M. J.*, 1940, 1: 884.

The authors present 2 cases of traumatic extradural hemorrhage and emphasize the inconstancy of the lucid interval, and the difficulties in clinical diagnosis and localization of the lesion. The second case illustrates the possible value of electro-encephalography as an aid in localization of the hematoma.

In the first case there was a definite history of a lucid interval, and the clinical course was that of spreading intracranial hemorrhage. At operation, the source of bleeding was found to be the superior longitudinal sinus rather than the middle meningeal artery.

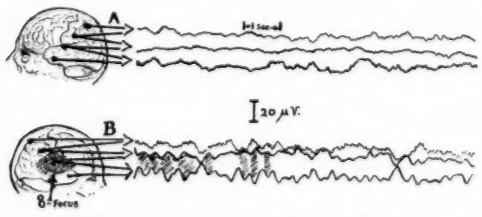


Fig. 1. Electro-encephalogram showing silent area over the hematoma.

In the second case the history was atypical, the onset of symptoms was late, and the course was more indicative of subdural than of extradural hemorrhage. Neurological signs gave a false location of the lesion, but an electro-encephalogram showed a silent area over the hematoma, apparently pointing to its true location. The accuracy of electro-encephalographic localization has not yet been determined, but if the method proves to be accurate it will have distinct advantages over ventriculography and encephalography because of its simplicity and harmlessness. John L. Lindquist, M.D.

Jefferson, G.: Extrasellar Extensions of Pituitary Adenomas. *Proc. Roy. Soc. Med.*, Lond., 1940, 33: 433.

In the author's own words this "account has been an attempt to broaden the conventional description and to correct too didactic a formulation of the nature of the pituitary adenoma, to account for variations in symptomatology, and to give reasons why operation is sometimes, though rarely, attended by ill success."

Size is not necessarily an index to the malignancy of a pituitary tumor, and unless there is either metastasis or invasion of the surrounding structures, regardless of its size and ramifications, the tumor must be considered benign, whatever its cellular structure may be. This is a new concept, and one which may not readily find acceptance in all quarters.

A pituitary tumor is influenced in its development by three factors.

1. The growth tendency of the adenoma and its nature. Some adenomas grow to a certain size and may thereafter fail to increase materially for no obvious reason, or they may continue to grow, as in some cases of acromegaly, long after metabolic changes have ceased to be apparently progressive. The adenoma may be large, cystic, and soft, or it may be tough, meaty, fibrous, and very vascular, the latter type being the most difficult of removal.

2. The fixation of the chiasm may be of such firmness that there is an unusual resistance to the tumor, and visual changes may be very slow and late to appear.

3. The sella and sellar diaphragm offer a variety of resistance. The fibrous tissues of the diaphragm and its dural supports offer far more resistance than does the underlying cancellous bone.

Extrasellar extensions may occur into the hypothalamus, the frontal lobe, the temporal lobe, and, more rarely, into the cavernous sinus, where the tumor then demonstrates Jefferson's criterion of malignancy. To the author "malignant adenoma" is an awkward term; to him it means that tumor cells have entered into locations where they would not be if the capsule were intact, though the cell type remains the same as that found in smaller tumors.

John Martin, M.D.

Horrax, G.: Concerning the Operability and Results of Operations for Brain Tumors. *Surg. Clin. North Am.*, 1940, 20: 653.

The author reports on the operative results of 400 cases of brain tumor. He divides these into operable and inoperable tumors. The former comprise 56 per cent and the latter 44 per cent. It is thus seen that well over one-half of all brain tumors can be completely extirpated and in most instances the patients are restored either to their former occupation or to a useful life. The mortality is about 12 per cent for the operable group and about 44 per cent for the other.

The meningiomas, pituitary adenomas, and acoustic neuromas made up the bulk of all the operable tumors; 26 gliomas were also in this group.

The group not suitable for complete extirpation consisted mainly of gliomas and metastatic carcinomas. Included in this group were also a few cases of meningiomas, pituitary adenomas, and acoustic neuromas.

Of the 224 patients included in the operable group, 26 died at operation or soon afterward, which left 198 survivors. A further 10 have died subsequently, which left 188. Of these the follow-up studies showed that 28 have major disabilities, such as very marked ataxia or motor weakness, or blindness. Thus, it is seen that 160 patients from the group of 224 with operable brain tumors have not only survived the operation but have been restored to complete health and useful activity or to a state very nearly approximating this. DAVID IMPASTATO, M.D.

Poppen, J. L.: The Treatment of Trigeminal Neuralgia: Peripheral Nerve Block. *Surg. Clin. North Am.*, 1940, 20: 663.

Peripheral nerve block for the treatment of trigeminal neuralgia can be performed in the office. When two divisions of the nerve are involved, each can be blocked at the same sitting. The alcohol injection, if successful, is immediately followed by a subjective feeling of numbness and other paresthesia. These may be extremely annoying. Normal sensation returns after a few months. Atypical facial pains which simulate tic douloureux are not relieved by these injections. Therefore, it is very important that a definite diagnosis of trigeminal neuralgia be made before injection is undertaken.

Detailed techniques for the injection for the various subdivisions of the trigeminal nerve are given in the article.

Occasionally mild complications occur following the alcohol injection. These are usually hematoma, dizziness, and headache. One patient suffered with nystagmus and diplopia. Transitory palsy of the sixth nerve and dilatation of one pupil have been observed.

The most important objection to alcohol injection is that it gives temporary relief only. The patient being aware of this remains apprehensive. Other objections are that the injections are painful and that in certain individuals the nerves cannot be reached because of scar tissue or abnormal bony protuberance. There are no contraindications to alcohol injection with the exception of local infection.

DAVID J. IMPASTATO, M.D.

Coleman, C. C.: Results of Faciohypoglossal Anastomosis in the Treatment of Facial Paralysis. *Ann. Surg.*, 1940, 111: 958.

Although any surgery for the repair of facial paralysis leaves much to be desired and a face which is never functionally normal, Coleman is a staunch adherent to the use of faciohypoglossal suture and a well directed reëducational program during the period of regeneration. With the increasing frequency of complete or subtotal removal of cerebellopontine angle tumors and the frequently resulting facial paralysis, this subject is of mounting importance. Faciohypoglossal anastomosis restores movement to the paralyzed muscles; the face assumes a "balance" in repose; and atrophy on the affected side is avoided. Naturally, such anastomoses must be made as early as feasible. During the stage of paralysis the sagging muscles must be supported by adhesive strips, and massage must be religiously employed to maintain tone in them. Maximum results may be expected by the end of two years.

As to reëducation, mass movements and resultant habitual abnormal grimaces are to be avoided by instructing the patient to suppress extreme facial movement and to keep the face in repose (at which time the affected side will in most instances be barely noticeable), rather than to practice attempting to make both sides of the face move in unison in the customary expressional movements. Certain cases of a severe nature may be treated by means of fascial support (Brown, 1938), together with nerve anastomosis. JOHN MARTIN, M.D.

PERIPHERAL NERVES

Fetterman, J. L., and Spitler, D. K.: Vascular Disorders of the Peripheral Nerves. *J. Am. M. Ass.*, 1940, 114: 2275.

Syndromes of the peripheral nerves may not only occur as the result of mechanical trauma or specific disease, but also may be due to direct vascular failure of the nutrient supply to the nerve. Such vascular disease of the peripheral nerves may be caused by (1) trauma, mechanical or chemical (arterial trauma as may occur in deep gluteal injections of bismuth); (2) embolism, the results of sudden plugging of the nutrient artery varying from ischemic neuritis to gangrene, according to the size and location of the embolism; (3) arteriosclerosis and diabetes mellitus, with a profound sensory and pain disturbance as the characteristic neuropathy; (4) thrombo-angiitis obliterans, the ischemia being accompanied by severe pain; (5) syphilis, because of the obliterative endarteritis and perivasculitis; (6) periarteritis nodosa, which according to Meyer, 1921, is accompanied by "chlorotic marasmus, polyneuritis, and polymositis;" (7) polycythemia; and (8) various

other states, such as progressive disseminating obliterative arteritis and proliferative intimitis.

In these conditions it can be shown histologically that a typical wallerian degeneration occurs peripheral to the ischemic source.

JOHN MARTIN, M.D.

MISCELLANEOUS

Homans, J.: Minor Causalgia: A Hyperesthetic Neurovascular Syndrome. *New England J. Med.*, 1940, 222: 870.

Causalgia, the entity originally described by S. Weir Mitchell, and "minor causalgia," an apparently related but less severe affliction, are still wanting an explanation of their cause and nature.

Homans, throwing them into that hodge-podge "30 per cent" of cases difficult to understand and classify, points out that the causalgias are as frequent today as they ever were; that they may be largely functional in nature and overlaid by hysterical symptoms; that not infrequently they are "compensation" cases; that most cases do not come to surgery; and that they may arise following such trauma as stab wounds, gunshot wounds, felons, bruises, major or minor infections following animal bites, fractures, and burns. He is in agreement with Leriche that the sympathetic nerves are basically responsible for the distress, although he cannot describe the exact nature of the dysfunction. It seems most probable "that perivascular sensitive fibers, whether lying upon a large vessel or surrounding many tiny arteries, whether in the soft parts or in the midst of a great nerve, are able to excite a prolonged, vicious, reflex, sympathetic disorder." He has found that patients are unmistakably relieved or even cured by procaine block of the "trigger zone," or by interruption of the reflex arc at any available point by procaine block or surgical excision.

JOHN MARTIN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Charache, H.: Tumors of the Male Breast. *Surgery*, 1940, 7: 889.

Tumors of the male breast are not frequently encountered. This author has collected 35 cases. These tumors comprise about 2 per cent of all neoplasms of the breast. Of all the tumors of the male breast 80 per cent are malignant, the rest benign, and carcinomas comprise 98 per cent of all the malignant tumors.

Carcinoma of the male breast differs in many respects from carcinoma of the female breast. The age incidence of the male is higher. Trauma is said to be a greater contributing factor. Male patients apply for treatment later in the course of the disease. Pain is a less frequent complaint. The nipple is more often involved than in the female and ulceration is present more frequently. The axillary glands are involved in more than 50 per cent of the cases. Lymphedema of the arm is less common than in the female. General and widespread metastases are present more frequently. The prognosis in the male is less favorable.

Fibro-adenoma and gynecomastia comprise 98 per cent of the benign tumors of the male breast. They are subject to malignant transformation although they may remain benign for a long time. Simple mastectomy is the treatment of choice, no matter how innocent the tumor may appear to be.

J. Daniel Willems, M.D.

TRACHEA, LUNGS, AND PLEURA

Sellors, T. H.: Chest Injuries in Modern Warfare. *Practitioner*, 1940, 144: 609.

Experiences in the Sino-Japanese and the Spanish civil wars show that through-and-through rifle bullet wounds are not likely to be seen. Fragments of bomb and shell are seen to produce all other varieties of penetrating wounds with laceration of the vital organs. Crushing from explosions and falling masonry have proved just as serious without penetration.

A distinctive difference between military and civil surgery lies in the type of patient. The soldier is a healthy adult in first class physical condition. The civilian may be of any age and in any state of health. Thus the civilian on the whole is likely to suffer more.

With chest wounds the injury of the casing is of less importance than the damage within. The signs and symptoms vary widely with the degrees of shock and hemorrhage present and with the area of lung put out of action. One syndrome is common to all chest wounds—shock and dyspnea. With penetrating wounds shock is instantaneous: the mental condition is unduly active and anxious, with aimless restlessness and a desire to be sitting up. An increasing pulse rate indicates that bleeding is still going on. Air hunger, a valuable diagnostic symptom in hemorrhage, is masked by the difficulty in breathing. Bursts of coughing exhaust and distress the patient. Pain depends on the amount of injury to the ribs. So long as the chest is at rest there is little pain, but any attempt at a deep breath brings a sharp stab of pain. The respirations are rapid, shallow, and incomplete, rather than deep and labored. Bursts of coughing are followed by lividity. Cough may be incessant and distressing. Blood in the sputum varies from staining to enormous quantities of clot and fluid. Bubbling sounds in the air tubes may be heard.

When an open pneumothorax is present the lung collapses entirely and air enters and leaves the lung by the external wound with each respiration. Sucking and blowing sounds accompanied by frothing blood require urgent attention. A valvular opening in the visceral pleura with coughing drives more and more air into the pleural cavity. The tension pneumothorax which follows may lead to high intrapleural pressure. Unless relieved it may result fatally. Nothing can be done for hemorrhage of a large pulmonary vessel. It is rapidly fatal. External bleeding from any penetrating wound is usually slight. The innocent appearance of minute punctures from small fragments of bomb may utterly belie the extent of internal damage. Bleeding from lung tissue is usually arrested after a time by the combined effects of collapse and the counter pressure of the pad of blood and air within. A pint of blood or more can be borne without undue distress. Subcutaneous emphysema is easily recognized. It is frequently seen when a rent in the parietal pleura is associated with a pneumothorax. With a few bouts of coughing the patient may blow up like a football. Pulmonary atelectasis is a common feature in chest injury, with or without penetration. Punctured or incised wounds of entrance may appear insignificant, but the exit wound, if present, may show gross lacerations with pieces of bone, clot, bits of cloth, and torn flesh. A small exit suggests that no bone has been encountered. A simple break in a bone without displacement is not dangerous, but spikes of comminuted or displaced fracture may puncture and lacerate lung tissue and such adjacent structures as the liver, diaphragm, or spleen. Large open wounds are always serious, more so in healthy young individuals whose mediastinum is supple and easily displaced. Relief of extreme distress is obtained when the external opening is closed. Severe crush injuries, "stove-in chest," imply rib fractures in more than one place and may create a flap disunited from the chest wall. Crushing injuries may also produce "traumatic asphyxia." Intense cyanosis and petechial hemorrhages under

the skin with subconjunctival bleeding result from forcible ejection of blood from the great veins of the chest in a backward direction.

Treatment is most important in the early stages. Severe shock and dyspnea demand warmth and morphine. A propped-up posture is more comfortable. Coughing is facilitated thereby and danger from atelectasis is minimized. As soon as possible careful search is made for wounds. Oxygen is a valuable adjunct to treatment. Its inhalation relieves dyspnea and cyanosis with corresponding improvement in the pulse rate and blood pressure. A pneumothorax does not necessarily require active treatment. Its presence may be beneficial in arresting hemorrhage from the lung. However, if the dyspnea is increasing the possibility of a tension pneumothorax should be realized. Relief of excessive intrapleural pressure is obtained by pushing a needle into the sac and letting out the air. It may even be wise to leave the needle *in situ* covered with sterile gauze.

Internal hemorrhage is a difficult feature to assess. An average lung injury does not produce a hemothorax of such size as to be fatal. Bleeding usually ceases spontaneously. Persistent bleeding may come from a divided intercostal or internal mammary artery. One or more ligatures passed tightly around the bone may constrict the artery in its groove. This procedure, however, is more difficult and probably less effective than it sounds. With a simple hemothorax the problem of the enclosed blood arises. Its removal is advisable. The blood always remains fluid and aspiration is easy.

Blood transfusion is valuable to combat shock and replace lost blood. When massive collapse is present efforts should be made to dislodge the obstructing plug or mucus. Coughing and postural drainage may help. If these fail bronchoscopy is a possible treatment. Subcutaneous emphysema is not serious and may be left unless extreme.

Treatment of the injuries themselves depends on the nature and extent of the damage. Adhesive-plaster strapping is done for broken ribs. Sucking wounds require an air-tight dressing, which substitutes a closed pneumothorax for an open one. Infection is always possible and therefore cleansing should be done as early as possible.

J. Daniel Willems, M.D.

Freedlander, S. O., and Wolpaw, S. E.: Chronic Inflammatory Lesions of the Lung Simulating Bronchiogenic Carcinoma. *J. Thoracic Surg.*, 1940, 9: 530.

Despite continued progress in the experience and ability to diagnose bronchiogenic carcinoma, there are many cases in which an exact diagnosis cannot be made. Also, there are several not uncommon conditions which closely simulate the signs and symptoms of this disease.

The authors present 4 cases of chronic inflammatory diseases which so closely simulated the accepted clinical picture of bronchiogenic carcinoma, including the onset, course, physical findings, roentgenological appearance, and in 1 case even the biopsy, that operation was advised and performed. Only examination of the tissues removed at operation proved their inflammatory character.

The authors believe that surgical intervention in borderline cases, in which bronchiogenic carcinoma is strongly suspected and the clinical and laboratory findings are consistent with the course of that disease, is definitely indicated. Many early tumors cannot be recognized with certainty even with the most advanced methods of diagnosis, and if operation is delayed until the picture is complete in all respects it may be too late to be of any benefit to the patient. The difficulty of recognizing the exact nature of the condition and of differentiating between bronchiogenic carcinoma and chronic inflammatory diseases, illustrated by the cases described, is carried over into the operating room; it has been found that even by direct inspection and palpation of the affected tissues it is impossible to differentiate clearly and accurately between the two conditions.

J. E. Tremaine, M.D.

Joly, H.: Pneumolysis with Thoracoplasty (À propos des pneumolyses associées à la thoracoplastie). *Presse méd.*, Par., 1940, 48: 522.

There are two operations which combine pneumolysis with thoracoplasty, one in which there is a more or less extensive resection of the upper ribs with an extrapleural separation of the plane of the lung from the thoracic cage, and another, suggested by Carl Semb, in which there is an extensive resection of the upper ribs, section of the intercostal vessels near the vertebral column, separation of the suspensory ligaments of the dome, and then extrapleural separation of the mediastinal (medial) surface of the lung from the thoracic contents. According to the Society for the Scientific Study of Tuberculosis (France), good results can be expected only in about 70 per cent of the cases when the first type of operation is performed. The author has performed the second operation, according to the technique of Semb, 34 times between November, 1938, and the end of 1939; in 29 cases the result was good and in 3 it was insufficiently good or bad; there were 2 deaths. In other words, good results were obtained in 85 per cent of the cases. This very satisfactory figure is thought to be due to three factors: the use of the Semb technique, its use in a reasonable manner which depends on the clinical and operative findings, and the manner in which the pneumolysis is accomplished, at times very completely and at others in rather a restricted manner so as to be regarded as a reasonable risk.

The great danger of the Semb method is infection. This can be largely avoided if certain formal contraindications are accepted; these are: any clinical or pathological indication of pleural infection; a previous history of homolateral, liquid serofibrinous pleurisy; axillary or cervical adenitis; and cold abscess in the thorax. In some cases infection may be

unavoidable on account of the separation of infected lymphatics when the lung is being collapsed. In other cases the risk of infection is known to exist, but the advantage outweighs that risk; that is true in certain cases of non-stabilized lesions in which it is most important to have an evenly distributed collapse in order to avoid a much feared focal reaction. In these cases it is important to avoid large pockets caused by the pneumolysis.

It is also wise to limit the pneumolysis when there is operative difficulty, principally in chronic cases in which there are dense adhesions to the trachea; a partial separation of the dome may be useful in such cases, whereas the complete operation may lead to serious consequences.

Recent ulcerations in the parenchyma are the best indication for this operation, and in these, brilliant results are obtained with a minimum of mutilation of the thorax. Children are particularly amenable to this procedure for the same reason and because the dome of the lung can be easily separated. This is one of the principal indications for the operation. The operation is a distinct advance in thoracic surgery, but the limitations of the procedure must be recognized or there is danger that it will fall into disrepute.

ADRIEN VERBRUGGHEN, M.D.

Maier, H. C., and Haight, C.: Large Infected Solitary Pulmonary Cysts Simulating Empyema. *J. Thoracic Surg.*, 1940, 9: 471.

Large infected solitary pulmonary cysts of the lung are often erroneously diagnosed as encapsulated empyema before operation, and at times the true condition is not recognized during or after operation. The pre-operative differentiation of a large infected pulmonary cyst and empyema is not always possible. Most of the reported epithelized pulmonary cysts have occurred in children or in young adults.

Patients with a pulmonary cyst are likely to have had previous respiratory symptoms and this history may date back to early life. The acute illness usually begins as a respiratory infection. They may or may not have a great deal of purulent sputum. Thoracentesis usually yields pus, but the character and culture of the pus may be similar to that seen in empyema. The roentgenological examination is frequently of great aid in the differentiation of empyema and infected pulmonary cyst but the lesions cannot be distinguished by this means in some cases. The contour of the fluid pocket is often of differential diagnostic value in that the outline of a cyst is spherical or oval in both postero-anterior and lateral projections, whereas the outline of an encapsulated empyema may be triangular or fusiform and conforms more to the contour of the thoracic cage or neighboring structures in the region it occupies.

At operation an absence of periosteal reaction on the inner surface of the underlying ribs may be noted in the case of an infected pulmonary cyst. It may be noted also that a portion of the cavity wall has the appearance of a lettuce lung with multiple bronchial fistulas. If a biopsy of one of the strands shows it to be covered completely by respiratory type of epithelium, the intrapulmonary nature of the lesion is demonstrated. If the true nature of the disease is not recognized at the time of the original drainage and the case is treated as an empyema, a striking feature in the postoperative course is the failure of the cavity to diminish progressively in size despite adequate drainage over a long period of time. The authors go into usual diagnostic factors very completely, then review 3 case histories, and arrive at the conclusion that radical surgery (lobectomy) is necessary in all cases.

PAUL MERRELL, M.D.

Broyles, E. N., and Fisher, G. E.: Bronchoscopic Experiences with Lung Tumors. *Surgery*, 1940, 7: 918.

From a study of 65 cases of bronchial tumors, the authors find that carcinoma of the lung is much more frequent than generally supposed, that it is four times more common in males than in females, and that it is most common between the ages of forty and forty-five. Carcinoma of the lung is more frequent in the white than it is in the colored race, and there is no causative relationship to occupation. The most common type is squamous-cell carcinoma, next is the adenocarcinoma, and next the undifferentiated type. The squamous-cell type usually spreads by contiguity and metastasizes late. The adenocarcinomas tend to metastasize early.

The symptoms and signs of carcinoma of the lung are fever, cough, pain, expectoration, hemoptysis, weight loss, dullness and diminution of breath sounds, and dyspnea. Bronchoscopy and roentgen examination are essential to diagnosis.

Early diagnosis and surgical removal offers the only hope of cure.

JULIAN A. MOORE, M.D.

Hauser, H., and Wolpaw, S. E.: Cavitary Bronchiogenic Carcinoma. *Radiology*, 1940, 34: 698.

In 15, or 12 per cent, of 127 cases of primary bronchiogenic carcinoma admitted to the Cleveland City Hospital cavity formation was demonstrated with the x-rays.

Cavitary bronchiogenic carcinoma may be confused with tuberculosis and pulmonary abscess and should be differentiated. The clinical history, the physical examination, or the roentgen examination is not sufficiently characteristic to make a conclusive diagnosis.

The history of an insidious onset, a non-productive cough later becoming productive with or without foul sputum, and persistent chest pain suggest carcinoma. The physical examination is not helpful. Certain features of the roentgen examination, particularly evidence of bronchial obstruction, is suggestive of malignancy.

Careful examination of the sputum and bronchograms, bronchoscopic examination, and biopsy will usually establish the diagnosis. Probably the bronchoscope is the most valuable means of diagnosis.

JULIAN A. MOORE, M.D.

ESOPHAGUS AND MEDIASTINUM

Barazzuol, E.: A Contribution to the Study of Muscular Tumors of the Esophagus (Contributo allo studio dei tumori muscolari dell'esofago). *Arch. ital. d. mal. dell'appar. digerente*, 1940, 9: 41.

Tumors of the esophagus, like neoplasms elsewhere in the gastro-intestinal tract, show a marked predilection for the male. The most common site of involvement in the esophagus has proved to be the lower third; the middle third is less commonly involved, and the upper portion is least involved. In the upper third the posterior wall is most frequently attacked, but in the two lower thirds the anterior wall is most frequently involved. The liomyoma is often rounded or ovoid, rarely exceeding the size of a hen's egg. Three cases of pedunculated liomyomas have been reported. For the most part the tumors are well encapsulated and on microscopic examination are found to contain abundant fibrous connective tissue through which bundles of smooth muscle fibers course in all directions. Vascularization is meager and degenerative changes are often present. Malignant degeneration, on the other hand, appears to be extremely rare although Bezzi has reported 1 case in which the neoplastic character of the lesion was histologically clear.

In the majority of cases clinical symptoms are absent. Dysphagia, hematemesis, weight loss, and obstructive symptoms occur occasionally. The absence of clinical manifestations is believed to be due to the tendency of the esophagus to dilate at the site of the tumor.

The author reports the case of a forty-one-year-old woman who died of cerebral hemorrhage, in whom was found, at autopsy, a liomyoma about the size of a large almond; it was firm, slightly nodulated, and yellowish-white. Histological examination revealed the mass to be deeply embedded in the muscular coat, the overlying epithelium being normal except for a flattening of the glands due to pressure. The tumor corresponded closely to those already described, and no indication of malignant degeneration was observed. As in cases elsewhere reported, the pathogenesis remained obscure. Clinical signs and symptoms were absent.

EDITH FARNSWORTH, M.D.

MISCELLANEOUS

Cato, F. L., and Norman, W. D.: Traumatic Hemothorax. *Surgery*, 1940, 7: 848.

When a chest wound in which hemothorax has developed is seen, a number of questions immediately suggest themselves: Is this a case for masterly neglect? Should thoracentesis be performed? If so, when should it be done and how much blood should be aspirated? Is immediate thoracotomy required? What are the comparative results of extreme conservatism, aspiration, and operation?

In an attempt to answer these and other questions, a series of 276 cases presenting definite evidence of hemothorax were analyzed. Only patients whose records showed one or more of the following findings were included in this study: (1) blood obtained by thoracentesis; (2) definite radiological evidence of fluid in the pleural cavity; (3) definite physical findings of fluid, with a clinical course compatible with blood in the pleural cavity; (4) hemothorax found at autopsy. In addition, all cases were included in which death from hemorrhage occurred within twenty-four hours after admission.

The authors discuss the symptoms, signs, and temperature curve; these are sufficiently characteristic as a rule, so that the diagnosis of hemothorax is usually simple. Properly interpreted x-ray films are also a valuable aid. It is important to remember that signs of hemothorax may develop many days following the original injury. Hemothorax is frequently associated with serious visceral injuries, which are the chief cause of the high mortality. Infection of the hemothorax seldom occurs and is not a frequent cause of death in civil cases. Its occurrence is an indication for open drainage.

Immediate operative intervention in selected cases is suggested as a possible means of reducing the high mortality rate in the first twenty-four hours. Repeated or continued bleeding from the chest wound and rapid reaccumulation of the hemothorax indicate that an intercostal or internal mammary artery has been severed. Immediate operation is indicated in such cases. Five deaths from this cause, all classed as preventable, are reported in this series.

Other indications for immediate operation include open sucking wounds, large lacerations of the lung, and large or heavily contaminated foreign bodies in the thoracic cavity.

Conservative treatment usually yields satisfactory results in patients who survive for twenty-four hours. Routine conservatism, however, is unsafe and dangerous. Early complete aspiration and controlled positive-pressure air replacement seem to be based on sound physiological principles and deserve a more extensive trial in sterile cases. To speak generally, aspiration is indicated for diagnostic purposes, as well as in large hemothoraces and in cases in which pressure symptoms are present.

SAMUEL H. KLEIN, M.D.

Overholt, R. H., and Betts, R. H.: A Comparative Report on Infection of Thoracoplasty Wounds. *J. Thoracic Surg.*, 1940, 9: 520.

Sterilization of the operating-room air and attempts to control that source of wound infection dates back to the days of Lister, but most emphasis, until recently, has been directed toward the control of the other factors responsible for wound contamination. In the past few years, however, contamination of clean fields by air-born bacteria has been given more attention and study, and the authors report results obtained in a well controlled and intelligently studied series of more than 700 consecutive thoracoplasties performed over a period of approximately thirty months.

Ultraviolet irradiation and its effect on wound contamination were studied. An ingenious arrangement of two batteries of two 12-in. quartz mercury vapor tubes each with suitable reflectors, was installed in the angle between the walls and the ceiling and directed toward the operating table. In studies carried on prior to irradiation during operations, it was found that a rapid reduction of bacteria in the air resulted following irradiation by these burners.

Wound infections were classed as superficial and deep: those involving only the superficial structures of the skin around the sutures, and those involving subcutaneous fat and muscle. Only clean cases were included in this list. Before the use of the ultraviolet irradiation 13.8 per cent of the cases showed some evidence of wound infection. A change in technique with interrupted sutures and the practice of covering the suture line with silver foil reduced the number of infected wounds to 6.53 per cent. This technique, with ultraviolet irradiation in addition, reduced the total number of wound infections to 2.67 per cent (11 of 411 cases), and only 2 of the cases had infections of the deep type and of clinical significance.

It is believed that this study is a valuable indication of the efficacy of ultraviolet irradiation because of the standardized technique employed and the similarity of the cases under treatment.

J. E. TREMAINE, M.D.

Petacci, M.: Primary Sarcoma of the Diaphragm (Sul sarcoma primitivo del diaframma). *Policlin.*, Rome, 1940, 47: sez. chir. 136.

Primary tumors of the diaphragm are rare. In 1931 Binney found in the literature only 4 cases of primary tumor of the diaphragm. The author discusses briefly the few cases in the more recent literature. He then reports a case he himself studied at the autopsy table, that of a forty-six-year-old man who had died after four months of illness. The chief symptoms had been pain in the right hypochondrium and anemia. There was never any icterus. The patient was admitted to the hospital in a serious condition with pain and swelling of the abdomen. At the time of death the diagnosis was tumor of the liver. At autopsy the anatomical diagnosis was: tumor of the right diaphragm with invasion of the liver; metastasis to the hepatic lymph glands and to the lymph glands of the pulmonary hilus; metastasis to the right lung by way of the blood stream; and neoplastic thrombosis of the portal vein with resultant ascites. The histological diagnosis was polymorphocellular sarcoma (Fig. 1).

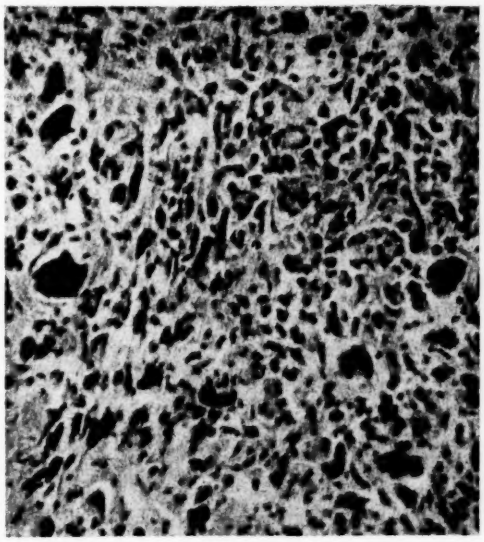


Fig. 1

JACOB E. KLEIN, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Zavaleta, D. E., and Veppo, A. A.: Taxis of the Strangulated Hernia (La taxis en las hernias estranguladas). *Rev. de med. y ciencias afines*, 1940, 2: 204.

Taxis is the manual reduction of a hernial tumor. It was first described and performed by Guillaume de Salicet and even if today it is considered a method of the past, it still has some indications which sometimes are of extraordinary importance.

The authors do not refer to forceful taxis but to an ensemble of methodical and careful manipulations which tend to reduce the tumor without any danger to the patient. The absolute indications of this maneuver are very few if one keeps in mind the extreme tightness of many hernial rings, the rapidity of the appearance of the lesions, and the real difficulties found during the operative reduction, even after the ring has been partially severed. However, even if the indications are very few, the surgeon can be called to perform the operation, keeping in mind the precepts of Gosselin who, in the last years of the past century, said that the reduction must be tried by taxis, under chloroformic anesthesia, when one is sure that the intestine has not suffered severe alterations, and in case the taxis is unsuccessful, one must revert without delay to the operation.

The absolute indications for taxis are: complete absence of a surgeon or even any doctor who could perform the simplest surgery, which is section of the ring through a short incision; patient in poor general condition; severe diabetes; acute pulmonary disease; an infectious condition; severe cardiac insufficiency; a septic process of the skin covering the tumor; pyodermatitis, and erysipelas.

The relative indications are: if the patient is far away from any surgical medium; if he is suffering from a chronic pulmonary disease, or a mild cardiac insufficiency, in case of old age with a good general condition, in controlled diabetes, in a newborn child, or in the insane.

The contraindications are: strangulation with a very prolonged evolution and alarming symptoms; a phlegmonous aspect of the hernial tumor which may be suspected of being the result of an inflammatory process, even if the condition has not been present for a long time. The absence of all of the absolute indications is also a contraindication, because taxis of the strangulated hernia is a typical example of an operation which must be performed as soon as possible, in the healthy individual as well as in a surgical patient.

It was a rule that taxis be done under general anesthesia, but to-day this statement cannot be accepted in every case, because the most important indications are those in which narcosis should be avoided. In some circumstances local or regional anesthesia may be used. The authors do not advocate spinal anesthesia. They think that a small dose of morphine is useful, and in little children, when reduction cannot be performed because of the effort of weeping, an enema of chloral will bring a peaceful sleep and spontaneous reduction, or taxis can be accomplished very easily.

The patient must be laid on his back, in the Trendelenburg position, so that the abdominal capacity is augmented and there is a slight relaxation of the muscles; the lower limbs must be in slight flexion and abduction. After the skin is prepared as usual, the freezing action of a pad soaked in ether may be tried. At times this will be of some use. The handling must be done only a few minutes and with the utmost softness; intense and prolonged compression must be absolutely proscribed: one must use the fingerballs, not the fingertips, push only with the strength given by the hand, and not employ the arm nor the forearm. The contents of the hernia must go back to their original place in the inverse order of their coming out. The maneuver results in the reduction, and can be done at one time or progressively. There is a characteristic sensation of the resistance being overcome, and the finger, introduced into the hernial channel, finds it completely empty. Soon after, the pain and vomiting disappear.

Sometimes the tumor persists partially, the intestine having been reduced but the great omentum remaining in the sac because of some adhesion. However, as the painful tumor has disappeared and there is an improvement of the general symptoms, one can wait with careful and continued examination of the patient.

The accidents associated with taxis are not very rare, even to-day. They may be caused by:

1. Lesions of the incarcerated organs. This is easily understood, if one remembers that the walls of the intestine are very much weakened by the lack of proper circulation, by the edema, and by the distention. Also, the mesentery can be torn and the vessels injured with the production of extensive hematomas.

2. Introduction of septic material in the abdominal cavity. This can happen when the septic fluids contained in the sac are pushed into the peritoneal cavity through the hernial ring or when they fall into it during the reduction. If an intestinal loop is gangrenous or perforated, it may be reduced without knowledge of this condition and the consequences will be such as can be expected from such a condition.

3. Persistency of the strangulation.

A. The false reduction shows the disappearance of the hernial tumor with persistence of the strangulation. This can happen when (1) there is a partial reduction of the incarcerated loops, one of them,

being of little volume, not being reached by the exploring finger; (2) there is a so-called reduction "en masse," in which the sac and its contents are reduced through the hernial channel without alteration of the respective relations and, consequently, the stricture of the neck of the sac is maintained; (3) at times the hernia is reduced but its contents, instead of going to the abdomen, are introduced into a diverticulum of the sac; (4) the contents of the sac escape through a rent of the wall of the sac; and (5) there is a circular rent of the neck of the sac and the reduction is performed with the neck, which still maintains the stricture.

B. An internal strangulation may follow the hernial strangulation when the taxis has been successful but the intestine again becomes strangulated by adhesions.

C. The strangulation may persist when its actual occurrence is not in the hernia and the intestinal distention causing the bulging of the hernial tumor is reduced, the strangulation being overlooked.

D. The symptoms sometimes persist after a successful taxis when the lesions of the bowel are so severe that the disappearance of the strangulation is followed by a paralytic ileus, which is very stubborn at times.

HECTOR MARINO, M.D.

Dobson, L.: The Late Results of the Injection Treatment of Hernia. *Surgery*, 1940, 7: 836.

Experimental studies were made to determine the reaction of tissues to various solutions recommended for the injection treatment of hernia. Injections were made into the rectus muscle of dogs in one series and sections were taken at various intervals. In another series injections were made into the abdominal wall above the spermatic funiculus, and the cords and testes were later removed for study. In brief, these experimental studies, as those of other workers, have proved that the injection of certain chemicals produces scar tissue. The reaction of the tissues to solutions of phenol and thuja (25 per cent phenol, 25 per cent specific tincture of thuja, and 50 per cent alcohol), tannic acid, or sodium psylliate was essentially the same for the various solutions.

Following the injection of sclerosing solutions, there was destruction of muscle bundles and the cellular response of a low-grade inflammation, with the development of sheets of fibrous tissue interlacing between the remaining muscle bundles. Within two months the fibrous tissue was dense and more adult in type. As time went on, the fibrous tissue contracted markedly, which left small islands of compact fibrous tissue, except for a few bands which extended through the entire muscle belly.

Injections into the spermatic cord produced a partial thrombosis of the veins with compression of the arteries. No changes could be demonstrated in the testes or ductus deferens. Although the processus vaginalis (hernial sac) was compressed, it was not obliterated except in one instance.

Seventy-four patients (70 males and 4 females) with 101 hernias were treated by the injection method. There were 68 indirect inguinal hernias, 21 direct inguinal hernias (including hernias with saddle-bag-type sacs), 10 postoperative inguinal hernias, 1 postoperative femoral hernia, and 1 umbilical hernia.

Based on this experimental and clinical work, the author arrived at the following conclusions:

There are several solutions available which safely and painlessly produce fibrous tissue. The sheets of fibrous tissue produced by the sclerosing solutions after from four to six months contract to form scattered islands of compact fibrous tissue.

The hernial sac is rarely obliterated or even occluded at the neck by the injections. Since muscle fibers are destroyed by the solution, large numbers of injections (over 30) may weaken the abdominal wall in the injected area by replacing muscle with fibrous tissue which eventually stretches. Since the sac is rarely obliterated, the whole basis of cure in the injection treatment of hernia is the fibrous tissue which persists between the fascial planes, muscle layers, and spermatic cord. These adhesions hold the hernial sac compressed and prevent omentum or bowel from entering the neck of the sac.

Follow-up studies on 101 hernias in 74 patients (followed for from six months to two and one-half years after the removal of the truss) showed a recurrence rate of 37.73 per cent in indirect inguinal hernias, 68.42 per cent in direct inguinal hernias, and 100 per cent in postoperative recurrent hernias.

The injection treatment of hernia should be used only in cases of small indirect inguinal hernias in patients with otherwise good abdominal structures who will not or cannot be operated upon.

SAMUEL H. KLEIN, M.D.

GASTRO-INTESTINAL TRACT

Meyer, H. W.: Perforations of the Gastro-Intestinal Tract. *Ann. Surg.*, 1940, 111: 370.

Perforations of the gastro-intestinal tract must always be considered as very serious. They must be regarded always as an emergency. The higher (esophagus) or lower (colon) in the gastro-intestinal tract the perforation occurs, the more serious the outlook. Even with an early diagnosis the mortality may be high.

In the urgent cases diagnosis is made from the general clinical picture, including a careful history and physical examination. There may be dull aching pain associated with shock which rapidly follows the perforation; the pulse is rapid and thready, the blood pressure low; nausea and vomiting may be present, and tenderness may be diffuse or localized. Abdominal distention is an unfavorable sign.

Perforations of the gastro-intestinal tract may be classified as: (1) injuries through the abdominal wall caused by bullets or knives, and (2) subcutaneous perforations caused by inflammatory or malignant erosions, by pressure generated within an organ, or by blunt force applied directly or indirectly to the abdominal wall.

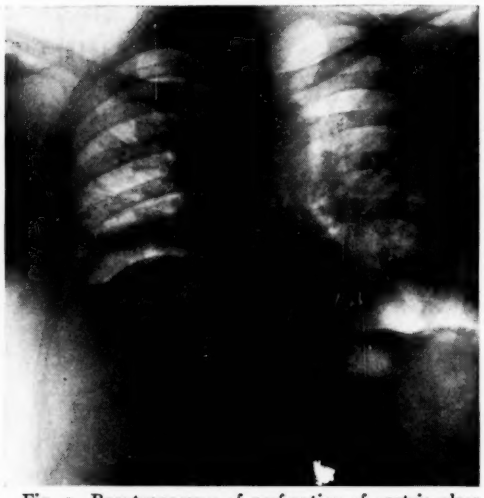


Fig. 1. Roentgenogram of perforation of gastric ulcer showing air and fluid under right diaphragm. (Courtesy of J. B. Lippincott Co.)

The discussion in this article is based on a series of 151 cases of perforation seen at the Lenox Hill Hospital, New York, from 1923 to 1938. In this series the writer excludes perforation of the appendix and of the gall bladder. Esophageal perforations had the highest mortality (87.5 per cent) and colonic perforations presented a mortality of 66.6 per cent, which was twice that of gastric and duodenal ulcers. Of the total number of 151 patients, 64 died, which gave a mortality of 42.3 per cent. The perforations occurred as follows: gastric ulcer in 81 cases; duodenal ulcer in 23; perforation of the esophagus in 8; traumatic rupture of the stomach in 1; perforation of the small bowel in 16; carcinoma perforation in 4; perforation of the colon in 6; and perforating diverticulitis in 12 cases.

Operative procedure. Fifty-eight of the 81 patients with gastric-ulcer perforations had simple closure of the perforation with 24.1 per cent mortality; 4 had simple closure of the ulcer plus appendectomy with 25 per cent mortality; and 13 had primary closure plus gastro-enterostomy with 30.7 per cent mortality. Two patients who had primary gastric resection at the time of the perforation survived. Two patients were drained, with 50 per cent mortality. In 2 cases the patients were so ill that operation was contraindicated and both died.

In the duodenal-ulcer cases, practically the same statistics were presented. Sixteen patients had simple closure with 4 deaths, or a 25 per cent mortality; 3 had closure of the perforation plus gastro-enterostomy with a 33 per cent mortality. Primary resection performed in 1 case resulted in death on the table. The total average mortality in the cases of duodenal ulcer operated upon was 34.7 per cent.

Butler believes that simple closure should be undertaken by all except the most experienced surgeons, and if the elapsed time is more than six hours and a chronic duodenal ulcer is present with moderate induration and deformity, excision of the ulcer should be performed, the incision being continued through the pyloric ring and the wound sutured transversely. When great deformity and a callous ulcer are present with the time of perforation less than six hours, a posterior gastro-enterostomy might well be performed. In gastric perforations only a simple closure with possible cauterization or excision of the ulcer margin should be performed regardless of the time of perforation.

It is the consensus of opinion, and the writer's experiences agree with this, that simple closure of a perforation is the safest procedure. Secondary gastro-enterostomy is rarely required and is much safer as a secondary procedure when indicated. Apparently in early cases drainage is not of much importance, but in late perforations it is definitely indicated.

The author then summarized his article:

The total mortality of all cases, operated or not operated upon, was 42.3 per cent, indicating the seriousness of the condition. The majority of all of the cases were perforations of gastric or duodenal ulcers with an operative mortality of approximately 25 per cent. These perforations of gastric or duodenal ulcers may occur without any previous ulcer symptoms. This happens more frequently in the gastric than in the duodenal type of ulcer.

The time element between perforation of the ulcer and operation is most important as regards the mortality. Perforations of duodenal ulcers are not as serious as those of gastric ulcers. In the cases with recovery, the time element was approximately three times longer in the duodenal than in the gastric series. Primary, simple closure appears to give the best results with the lowest mortality. Secondary gastro-enterostomy after simple closure is rarely necessary. If pyloric stenosis is to occur, it usually develops within one year of the primary closure.

Recurrent ulcer symptoms may be associated with hemorrhage. Recurrent ulcers may be of gastric, duodenal, marginal, or stomal type if gastro-enterostomy has been previously performed. In these cases gastric resection is occasionally required. The most frequent cause of operative mortality is peritonitis with secondary pneumonia.

Esophageal perforations, while infrequent, are attended with a high mortality. Early operations with extensive drainage are required to save the patients' lives.

Perforations of the small bowel result from a wide variety of causative factors. Trauma is the most important. The surgical procedure should be as simple as possible.

Colon perforations, as well as those involving the sigmoid and rectum, are followed by a high mortality, because of the high degree of infectiousness of the colonic contents with resultant peritonitis.

The most common type are those of perforation of the sigmoid diverticula and the mortality for these is high. JOHN W. NUZUM, M.D.

Fulchiero, R.: The Value of Gastric Chromoscopy with Neutral Red (Il valore che si deve attribuire alla cromoscopia gastrica col rosso neutro). *Arch. ital. d. mal. dell'appar. digerente*, 1940, 9: 117.

Glaessner and Wittgenstein in 1923 were the first to use gastric chromoscopy with neutral red clinically. They injected 5 c.cm. of a 1 per cent solution intramuscularly and then studied the gastric secretions. In 40 cases they found that the neutral red appeared within from ten to fifteen minutes in the case of normal acidity, within from five to eight minutes in hyperacidity, and within from twenty to sixty minutes in hypo-acidity. The author reviews the literature on the subject since then and notes that the views of various authors differ markedly.

The author studied the procedure on 78 patients. He used 20 patients without digestive disturbances as controls and injected the neutral red intramuscularly and in another group of 20 without digestive troubles he injected the dye intravenously. The remainder were patients with appendicitis, duodenal ulcer, carcinoma, and cholecystitis. The excretion of the dye was correlated with the study of the gastric acidity.

On the basis of these studies he concludes:

Neutral red in a dose of 5 cgm. is harmless when injected intravenously or intramuscularly and causes no general reaction.

The excretion of neutral red by the gastric mucosa is independent of the secretion of the digestive juices.

The maximum intensity of excretion of the dye does not correspond with the maximum excretion of the gastric acidity.

There is no correlation between the quantity of gastric juice secreted and the rapidity of appearance of the color.

The procedure did not enable the differentiation between true and false gastric achylia, and he finally concluded that it had no diagnostic value and should by no means displace gastric analysis.

JACOB E. KLEIN, M.D.

Doub, H. P.: The Differential Diagnosis of Pyloric and Prepyloric Ulceration. *Am. J. Roentgenol.*, 1940, 43: 826.

The improvement in roentgenological technique has made it increasingly easier to demonstrate ulcerative lesions in the prepyloric and pyloric areas, but the differential diagnosis of these lesions has not been improved. These areas are important because they are the site for the majority of all gastric carcinomas, benign gastric tumors, and gastric syphilis. They are also the favorite location for benign gastric ulcers, spastic phenomena, and hypertrophic pyloric stenosis.

Roentgenological examination alone cannot always lead to accurate differentiation between benign and malignant ulceration here. The final diagnosis must of necessity rest upon a careful study of serial sections of the resected lesions. Improvement effected by medical-ulcer therapy may persist for some months even in a malignancy.

This work follows the recent trend in that the author limits his study to lesions of the pyloric ring and the prepyloric area within 1 in. of the pylorus. The report of Holmes and Hampton from the Massachusetts General Hospital, Boston, in which malignant prepyloric ulcerations were found twelve times more frequently than benign ulcerations is again contrasted to that of Singleton from the Toronto General Hospital, Toronto, Canada, of a series of 7 cases which were all benign gastric ulcers.

The author's report comprises 35 cases. The final diagnosis, determined histologically, showed benign peptic ulcer in the cases of 24 patients, carcinoma of the antrum in 7, chronic gastritis in 3, and syphilis in 1. It was impossible to reach a definite diagnosis on roentgenological findings in the doubtful cases, although the presence of a slightly overhanging border which, upon pressure, presents a ridge displacing the barium and leaving a clear zone around the ulcerated area, is of some help.

The conclusions were that chronic ulcers occurring in the pyloric and prepyloric areas have a greater tendency toward malignancy than similar ulcers in the body of the stomach. A differential diagnosis between carcinoma and ulcer presents great difficulties. A satisfactory response to medical therapy should not eliminate a suspicion of malignancy, and an early diagnosis is most important if these lesions are to be operated upon early enough to permit resection. Although there may be some objection to resection because of the operative mortality, only 1 postoperative death, approximately 3 per cent, occurred in this series, which is far less than the mortality would have been if resection had not been performed early in the cases of carcinoma in this group. SAMUEL J. FOGELSON, M.D.

Emile-Weil, P., Brocq, P., and Eudel, F.: Polyps of the Gastric Mucosa in Pernicious Anemia; a Case of Gastrectomy Followed by Cure (A propos des polypes de la muqueuse gastrique dans la maladie de Biermer. Un cas de gastrectomie suivie de guérison). *Mém. Acad. de chir.*, Par., 1940, 66: 376.

Emile-Weil and his associates report a case of pernicious anemia in which mucous polyps developed at the pyloric antrum. As this gastric lesion is not widely recognized as occurring in pernicious anemia, atrophic gastritis being considered characteristic, the presence of the polyps may lead to errors in diagnosis. In the case reported the diagnosis was further obscured by the fact that the blood count as reported at the time of the first examination was not typical of pernicious anemia. The correctness of this report is doubtful.

The patient was a man of fifty-three years of age, who gave a history of attacks of diarrhea alternating with periods of constipation. Recently he had had

a few attacks of vomiting, and on one occasion had noted blood in the stools. He had lost much weight. These symptoms in a man of his age suggested cancer of the gastro-intestinal tract. Examination with the rectosigmoidoscope was negative. Roentgenological examination with the opaque meal showed a definite defect in the prepyloric region and the antrum. The fluoroscope showed this region to be rigid and immobile. These findings were constant on repeated examinations. The blood count, as reported, showed a definite anemia—red cells, 3,505,000; myelocytes, 5 per cent; and metamyelocytes, 3 per cent. The report as given did not definitely indicate pernicious anemia. On the basis of the clinical and roentgenological findings, operation was indicated. At operation, there was no enlargement of the glands, but several tumors were found on palpation in the region of the antrum, and gastrectomy was done. After operation the patient developed a high temperature and showed an unusual pallor without any evidence of infection in the operative field or hemorrhage. A second blood count showed only 1,280,000 red cells with a color index of 1.6, anisocytosis, and nucleated red cells. The diagnosis of pernicious anemia was confirmed by a third blood count and sternal puncture. Two blood transfusions were given combined with the injection of liver extract and vitamin treatment. After the second transfusion, the patient showed marked improvement. Additional transfusions were given combined with the administration of an extract of gastric mucosa; the patient made a good recovery, and has been kept in good health and able to work by continuing the anti-anemic therapy.

Examination of the section of stomach removed showed hypertrophy of the pylorus resembling that found in infants. The gastric mucosa showed marked atrophy except for a localized hypertrophy in the pyloric antrum, where there was marked epithelial proliferation and polypoid formation. There was no evidence of malignancy.

In this case the diagnosis of gastric carcinoma was based on the symptoms, the presence of achlorhydria, and the roentgenological findings. The presence of pernicious anemia was not recognized until after the operation. Achlorhydria and atrophy of the gastric mucosa have been recognized as typical of pernicious anemia for many years. However, the presence of polypoid formations in the stomach has not been frequently noted, at least in France. Some investigators in the United States and Germany, however, have reported a number of cases in which gastric polypi were associated with pernicious anemia. The correct diagnosis of gastric polypi is difficult even with modern methods of roentgenological examination; gastroscopy is of definite aid, but even the gastroscopic picture may not definitely show the presence of polyps. The gastroscopic examination is of greatest aid when considered in relation to the roentgenological findings.

It should be recognized that gastric polyps may develop in the course of pernicious anemia; in fact, they may be regarded as resulting from the inflammation of the gastric mucosa which is so constant a feature of this type of anemia. While modern treatment with gastric and liver extracts may bring about a complete remission of the anemia, the polyps persist. Such polyps may undergo malignant degeneration, and this may explain the origin of certain gastric cancers that have been observed in cases of pernicious anemia. This does not imply that every patient with pernicious anemia and associated gastric polyps should be submitted to a gastrectomy. The case reported shows, however, that if gastrectomy is indicated in such cases, it can be done with safety, provided intensive anti-anemic treatment with liver and gastric extracts is given.

ALICE M. MEYERS.

Highman, S. E.: An Analysis of Five Years' Hospital Records of Gastric and Duodenal Ulcers. *South African J. M. Sc.*, 1940, 5: 20.

This study was undertaken to establish "certain fundamental facts on peptic ulcer" in the European population of South Africa, where the climate is subtropical. It was stimulated by the knowledge that the South African native has a very low incidence of ulcer occurrence.

The material consisted of 245 cases in which it was found that the acidity, sex, and age incidence of peptic ulcer in the European in South Africa were very similar to these factors in Europe and America.

SAMUEL J. FOGELSON, M.D.

Zanetti, L.: Hypoglycemic Manifestations in Gastric Surgery (Le manifestazioni ipoglicemiche nella chirurgia gastrica). *Arch. ital. d. mal. dell'appar. digerente*, 1940, 9: 21.

Among the postoperative disturbances manifested by patients with ulcer, a syndrome characterized by fatigue, anxiety, tremors, vertigo, palpitation, vasomotor irregularities, and occasionally nausea, somnolence, and fall of arterial blood pressure is worthy of note. These symptoms appear shortly after meals and simulate in all respects the familiar picture of hypoglycemia, and investigations showed that the individuals so affected gave an atypical glucose tolerance curve marked by low values after from one to two hours; a possible association with gastric hyperacidity was also noted.

Zanetti controlled his experiments with a series of patients who had undergone laparotomies for conditions other than peptic ulcer, in order to rule out a non-specific surgical complication. In this series no abnormalities of glucose metabolism were observed. A second group of patients were then studied, patients in whom ulcers were present but who had not undergone surgical intervention. Of this group 1 patient showed high gastric acidity which appeared concomitantly with an episode of hypoglycemia, one and one-half hours after a meal rich in carbohydrates.

The first experimental group consisted of 31 patients upon whom a gastric resection had been done.

Twenty-one of these reacted normally to the ingestion of dextrose; 8 complained of nausea, headache, perspiration, and hunger; it was necessary to abandon the test of the remaining 2 patients because of the severity of the symptoms. In the 10 individuals manifesting hypoglycemia after from one to two hours the blood sugar values varied from 58 to 69 mgm. per cent, and were preceded by peaks at the half-hour period. The symptoms were of short duration.

Seven patients upon whom gastro-enterostomy had been performed comprised the next group. Of these, 2 had protracted periods of moderate hypoglycemia.

Three patients in whom the pylorus and duodenum had been removed showed no noteworthy abnormalities of the carbohydrate metabolism.

On the basis of these experiments the author advances the opinion that since the absorption of carbohydrates is more active in the jejunum than in the duodenum or the ileum, it is probable that the arrival of large quantities through the anastomotic opening to that portion of the intestine causes the absorption of unduly large quantities of glucose. The abrupt hyperglycemia then elicits an extraordinary output of insulin which later brings about the observed hypoglycemia. EDITH FARNSWORTH, M.D.

Lahey, F. H.: The Diagnosis and Treatment of Gastrojejunal Ulcer and Gastrojejunocolic Fistula. *Surg. Clin. North Am.*, 1940, 20: 767.

In any patient who has had a duodenal ulcer, the symptoms of which have been relieved by gastro-enterostomy, the recurrence of active ulcer symptoms should make one conscious of the fact that such symptoms are in all probability due to gastrojejunal ulcer. There are certain types of individuals in whom there seems greater likelihood of the occurrence of a gastrojejunal ulcer following the employment of gastro-enterostomy for peptic ulcer than in others. The younger the individual and the higher the acids, the more likely is the possibility of gastrojejunal ulcer.

There are certain types of operative procedure which are known to predispose to the formation of gastrojejunal ulcer, particularly von Eiselsberg's exclusion of the pylorus.

In addition, it has been said that the lower the segment of jejunum which is anastomosed to the stomach the less well equipped is that segment to receive acid gastric contents. For that reason posterior gastro-enterostomies with their short jejunal loop probably have a slightly lower incidence of gastrojejunal ulcer than operations involving the antecolic loops, in which lower levels of the jejunum are attached to the anterior wall of the stomach, as these levels are less well equipped to withstand the effects of direct dumping of gastric-acid contents onto their mucosa.

In the past years another factor has been thought to influence the formation of gastrojejunal ulcer: the employment of non-absorbable suture material. It was the author's opinion that when a gastrojejunal ulcer occurs in the presence of a non-absorbable suture, the suture can well be described as an innocent bystander.

The dangers of gastrojejunal ulcer are intraperitoneal perforation, hemorrhage, and perforation into the transverse colon.

The x-ray diagnosis of gastrojejunal ulcer is evidenced by stenosis of the opening, the appearance of a fleck of barium, rapid emptying of the stoma, or by rigidity of the stoma.

While it has been stated in the past that gastrojejunal ulcers are not amenable to medical treatment, that has not been the author's experience and it is his opinion that these cases should all be given a trial of medical treatment first.

The surgical treatment of gastrojejunal ulcer should be radical. The author's experiences with conservative surgical measures for this condition, such as pyloroplasty, secondary gastro-enterostomy, or restoration of the alimentary stream to its normal position, have been unsatisfactory. The operation of choice for gastrojejunal ulcer is high subtotal gastrectomy, together with removal of that portion of the jejunum containing the ulcer. The end-results with this operative procedure have been satisfactory. If gastric resections are to be high, they cannot be done with clamps. The author has been able to do non-soiling, high resections in subtotal gastrectomies largely because of the de Petz sewing machine. The other factor which has to do with success in subtotal gastrectomy for peptic ulcer in general is that, after the jejunum has been anastomosed to the stomach, no jejunojejunostomy is done. For a number of years the author employed the Polya anastomosis, by means of which the jejunum is anastomosed to the entire cut end of the stomach. Now for a number of years this has been entirely abandoned for the Hofmeister type of anastomosis, in which the upper half of the stomach is closed, the jejunum is anastomosed side-to-end to the lower open half of the stomach, and the remaining jejunum is buttressed as a reënforcement over the closed upper half of the stomach.

JOSEPH K. NARAT, M.D.

Bercovitz, Z.: Recent Advances in the Treatment of Chronic Ulcerative Colitis. *Med. Clin. North Am.*, 1940, 24: 683.

Experiments carried out by the author over the past four years indicate that the presence of cellular exudates in the bowel discharge points to pathological change in the bowel wall, whereas the absence of cellular exudates may mean that the bowel condition is not associated with anatomical change. To study cellular exudates, a smear of bowel discharge is made with Loeffler's methylene blue and protected with a coverslip. Examination under oil immersion reveals two well defined types of cells: polymorphonuclear leucocytes and epithelial cells. A report of the presence of endamoeba histolytica in diarrheal discharges should not be accepted as final until or

unless typical forms of the ameba have been found. If there is any suspicion that cysts of protozoa may be present, Lugol's solution should be used to bring out the nuclear structure.

Because lymphogranuloma venereum so frequently enters into the differential diagnosis of chronic ulcerative colitis, the author routinely tests all patients with Frei antigen. It is also emphasized that diarrhea is frequently the result of constipation or even a narrowing of the bowel lumen. Therefore digital and sigmoidoscopic examinations are of vital importance as diagnostic procedures.

It has recently been recognized that vitamin deficiencies are often associated with chronic ulcerative colitis. Deficiency frequently lies not in the quantity of essential vitamins ingested, but in the amount absorbed and utilized by the body. Eighty-two per cent of the author's series of 32 patients with chronic ulcerative colitis showed evidence of Vitamin-C deficiency. Seventeen of 20 patients followed up were relieved of symptoms or moderately benefited after taking 300 mgm. of ascorbic acid daily for several weeks. The oral ascorbic-acid requirement in patients with chronic ulcerative colitis apparently is increased roughly in proportion to the number of stools and the amount lost in the stools. From 2,000 to 6,000 mgm. of ascorbic acid are often necessary to "saturate" such patients, depending upon the degree of deficiency, the mode of administration, and other factors influencing the requirements. After this initial dose, it was found that oral maintenance requirements ranged from 100 to 200 mgm., given in divided doses daily.

Because many patients with chronic ulcerative colitis have low hydrochloric-acid values in the gastric juices, it is often helpful to prescribe hydrochloric acid and pepsin. Although Vitamin B and liver extract given by injection have caused improvement in some patients, it is not known whether this has been due to maintenance of the general condition, or direct treatment of a deficiency factor.

The use of histidine hydrochloride has been of questionable value in the treatment of chronic ulcerative colitis. It was thought that if the drug had a beneficial effect on the gastric mucosa, it should have a similar effect on the mucosa of the bowel. Although no changes in the bowel mucosa have been demonstrated, histidine has proved beneficial in a fairly high percentage of cases observed in the past three years. The general impression of this method of treatment is that the results are sufficiently encouraging to warrant continuing it.

Whereas formerly blood transfusion was resorted to as a final measure of desperation, today it is regarded as one of the chief methods of approach to the treatment of this disease, and it is emphasized that transfusion should be given early and in adequate amounts. Neoprontosil has been of little value in the treatment of the author's patients, but the doses used were not large.

Careful attention must be given to foci of infection, particularly in the urinary tract.

Patients with chronic ulcerative colitis should have a high protein and low residue diet, well balanced in vitamins and with enough starches added to maintain caloric requirements. The value of any new method of treatment of chronic ulcerative colitis depends upon the success with which the following requirements are met: (1) a large number of cases in which the diagnosis has been properly confirmed must be followed up; (2) a sufficiently long period of time before, during, and after treatment must be allowed for observation in order to rule out spontaneous or seasonal remissions (the author suggests that this period be from three to five years); and (3) another group of patients, treated by other methods, should be carefully observed for comparison over the same period of time.

HAROLD LAUFMAN, M.D.

Cherney, L. S.: Appendiclausis: Appendiceal Obstruction Simulating Acute Appendicitis. *Surgery*, 1940, 7: 900.

Many patients who are thought to have acute appendicitis are found at operation to have an apparently normal appendix and no pathological explanation for the clinical symptoms which they manifest.

The author reviewed 100 clear-cut cases which were diagnosed pre-operatively as acute, mild acute, or subacute appendicitis, or as an acute or subacute flare-up of chronic appendicitis, in which the appendix exhibited no gross or microscopic evidence of acute inflammation. In 88 per cent of these patients there was definite obstruction to the lumen of the appendix by feces, fecaliths, kinking, or cicatricial constriction. In contrast, obstruction was found in 19 per cent of 100 cases of chronically inflamed or incidentally removed appendices and in 14 per cent of 325 consecutive autopsy specimens.

The term appendiclausis, derived from the Latin "claudere" meaning to bar or to close, is suggested for a definite disease entity in which there is obstruction of the appendix without any evidence of active inflammation. It is almost impossible to differentiate the clinical picture of appendiclausis from that of acute appendicitis and for this reason the logical treatment is appendectomy. The diagnosis of appendiclausis is usually made at operation.

The clinical and laboratory findings in the 88 cases of proved appendiclausis were compared with those in 100 cases of proved simple acute appendicitis. There were very few differentiating features. The age incidence for obstruction was slightly earlier than that for acute appendicitis, and appendiclausis was more common in females than in males. A history of previous attacks was more often obtained from patients with obstruction. Cramps or colic occurred in only 36 per cent of the patients with appendiclausis and pain was generally less severe than in patients with appendicitis. Patients with appendiclausis were more likely to have pain localized in the right lower quadrant from the start, although, even among them, the majority had epi-

gastric or generalized abdominal pain at the onset. Few patients in either group had any variations in bowel habits. Vomiting was more frequent and more severe in patients with appendicitis. The average temperature and pulse rate were almost identical but the average leucocytosis was less in appendiclausis. Localized abdominal tenderness was present in 99 per cent of the patients with appendicitis and in 100 per cent of the patients with appendiclausis. Abdominal resistance, rebound tenderness, and rectal tenderness were but slightly more frequent in patients with appendicitis.

The author adds a final note of warning that the acceptance of appendiclausis as a clinical entity justifies neither unwarranted appendectomy performed without painstaking preliminary study of the patient nor delay of operation for acute appendicitis.

EDWARD W. GIBBS, M.D.

Scaffidi, V., Jr.: Purely Proliferating Rectitis of Amebic Etiology (Rettite pura proliferante ad eziologia amebica). *Arch. ital. d. mal. dell'appar. digerente*, 1940, 9: 139.

Scaffidi reports the case of a man, aged forty-five years, who never had had any attacks of dysentery or of persisting diarrhea, but had presented for the past six months a pure syndrome of rectitis without any symptoms of colitis; he had lost considerable weight recently. Rectoscopy revealed a moderate swelling of the mucosa at 8 cm. from the anal orifice and on the anterior wall of the rectum. This swelling extended for about 2 cm., and was irregularly rounded, congested, and covered with serosanguinolent mucus; removal of the mucus did not disclose any ulceration. The remaining mucosa even in the immediate vicinity of the swelling was completely normal. Examination of the mucus taken directly from the lesion revealed the presence of a large number of vegetative forms of entameba histolytica. Repeated examinations of the internal portion of the well formed feces never showed any amebas or cysts. The diagnosis of hypertrophic proctitis of amebic nature was made and the patient was treated with emetine, of which he received 65 cgm. Examination at this time was negative, except for a slight congestion of the mucosa. Consolidation treatment with stovarsol and yatren and a second series of emetine injections were prescribed. The patient has had no recurrence.

The amebic nature of the process could not be suspected from the clinical data alone in the presence of a negative history and of an inflammatory process of the purely proliferative type, clearly circumscribed and without ulcerations. Undoubtedly, proliferative manifestations directly or indirectly dependent on entameba histolytica infection have been described in chronic amebic dysentery, alone or associated with the various aspects of ulceration characteristic of the disease. However, the fact that amebas have not been searched for locally in these cases and were demonstrated only in the feces fails to establish the direct connection of these lesions with entameba histolytica. Histologically, these proliferative lesions may assume the inflammatory or the neoplastic form; the latter consists of adenomatous proliferation of the cells of the rectal mucosa to varying size which, according to some authors, may undergo carcinomatous degeneration.

The anatomical and functional manifestations of amebic infection depend on the action of the agent and the reaction of the organism. If the latter is good but insufficient to overcome completely the invading amebas, circumscribed ulceration with marked delimiting connective-tissue reaction will take place. The strong connective-tissue reaction and the resistance of the rectal mucosa to invasion by the amebas, in spite of continuous contact with them, make the development of the localized hypertrophic lesion of the rectum understandable in the present case. On the other hand, as no biopsy of the lesion was made, it is impossible to exclude the presence of small ulcerations, whether microscopic or hidden in some fold of the mucosa; in fact, without ulceration it would be difficult to explain why a large number of amebas, with all the characteristics of pathogenic activity, were found on the lesion.

The presence of dysenteric antecedents is not necessary for the diagnosis of amebic infection because there are cases in which the infection remains latent in the intestine and may later be revealed by a clinically primary abscess of the liver. However, careful investigation of the history of ameba carriers always reveals some suspicious intestinal incident which may have occurred a long time ago. The exclusively rectal localization of the amebic infection does not prevent recognition of the disease and becomes understandable when the possibility of proliferative manifestations and of latency of the infection in the colon are taken into consideration. On the other hand, the fact that no amebas were found in the formed feces does not exclude infection of the colon. In any case, the simultaneous absence of dysenteric antecedents, of a colitic syndrome, and of rectal ulceration was the greatest obstacle to the diagnosis of the case until amebas were found, and the present case is undoubtedly exceptional from this point of view. As to the significance of the results obtained with emetine treatment, the etiological diagnosis based on the demonstration of amebas is naturally confirmed by the success of the treatment, but regression and subsequent disappearance of the lesions under emetine treatment without demonstration of the amebas are insufficient to establish the etiological diagnosis of amebiasis.

RICHARD KEMEL, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Ferrando, F. F.: The Treatment of Acute Cholecystitis (Tratamiento de las colecistitis agudas). *Rev. méd.-quirúrg. de patol. femenina*, 1940, 15: 280.

The author, after reviewing the literature and describing his personal cases, gives the results of his

experience in the treatment of acute cholecystitis. He advocates early and emergency operations.

Cholecystectomy, which the author considers the operation of choice in acute cholecystitis, is recommended because of its simplicity. Infiltrative edema of the peritoneum makes dissection of the gall bladder extremely easy, as the latter can be very simply separated from the hepatic bed and the omental adhesions by blunt dissection. On the other hand, once the inflammation has subsided, the operator very often finds firm adhesions which unite the gall bladder to the duodenum, the transverse colon, and the great omentum; only part of the gall bladder may then be removed with the accompanying danger of perforation of the organs which form the subhepatic block.

The postoperative condition of patients who have undergone early operation is better than that of patients upon whom a late operation has been performed: there are fewer complications and the period of hospitalization is shorter. The operative mortality is more or less the same for the two procedures.

It is impossible to ascertain, from the clinical aspect of a case, the extent of the lesions of the gall bladder. A patient with a necrotic process, in danger of perforation, has the same symptoms as a patient with less important lesions. The author found necrotic lesions in 20 per cent of his cases, and examination of these cases did not reveal any symptoms which gave a definite indication as to the severity of the condition present.

Ether anesthesia was used in one-half of the cases and, in the other half, spinal anesthesia with 6 mgm. of percaine.

The operative procedure used was anterograde cholecystectomy, which is very much facilitated by puncture and aspiration of some of the contents of the gall bladder. In order to facilitate section and ligation of the cystic duct, the author calls attention to the fact that in acute cholecystitis, the proximal portion of the gall bladder is found enlarged and distended and rests directly upon the common duct. Edema unites both organs in such a manner that one has the impression that the serosa of the small omentum is united with that of the gall bladder, and that there is an enormous cystic duct. The author advises separation of the gall bladder from the common duct by blunt dissection with the tips of the scissors, so that the cystic duct is well freed. In case this procedure is difficult and dangerous, he advocates section of the gall bladder, a piece of it being allowed to remain.

The piece of edematous gall bladder which remains in the ligature is the cause of biliary discharge occurring the first few days following the operation, because once the infiltration disappears, the ligature becomes loose and the cystic duct allows the passage of some bile. Only twice has the author encountered hemorrhage from the cystic artery during the operation. However, this eventuality could be very easily taken care of by compression of the hepatic pedicle between the index finger and thumb of the left hand, as it stops the hemorrhage very quickly. Drainage obtained by the use of one wick of gauze and one rubber tube of medium size made for a better postoperative course than when larger drains were employed.

HECTOR MARINO, M.D.

GYNECOLOGY

UTERUS

Teahan, R. W., and Wammock, H.: The Results of Treatment in Carcinoma of the Uterine Cervix. *Am. J. Obst. & Gynec.*, 1940, 39: 995.

From February 1, 1928, to December 1, 1934, 136 patients with carcinoma of the cervix were seen by the authors. Of these, 122 were treated and 26 have remained well for at least five years, an absolute-cure rate of 19.1 per cent and a relative-cure rate of 21.3 per cent. With one exception, these patients were treated exclusively by radiological methods.

The best results were obtained by combined x-ray and radium treatment. The interval between the appearance of the first sign and the patient's first visit to a physician averages five and one-half months. The interval between the first visit to a physician and the first pelvic examination averages two months. The interval between the first pelvic examination and the institution of cancer treatment averages three and one-half months.

There is an average delay of eleven months between the appearance of the first sign and the initiation of cancer treatment. While the patient is consulting a physician more promptly after the appearance of the initial sign, there does not appear to be any shortening of the interval between the first visit and the first pelvic examination. A large number of the patients were treated for cancer before admission and were given more treatment because the disease had not been controlled. In 69 patients the treatment was initiated by the authors and 22 of these lived five years or more, a cure rate of 33.3 per cent. EDWARD L. CORNELL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Feldmann, E.: A Clinical and Etiological Study of Torsion of the Pedicle in Ovarian Tumors (Beitrag zur Klinik und Aetiologie der Stieldrehung bei Ovarialtumoren). Basel: Dissertation, 1939.

After a short clinical description of ovarian tumor with torsion of the pedicle, the author presents a detailed critical review of the various theories on torsion of the pedicle. During the period from 1920 to 1938, there were recorded among the total of 19,614 patients visiting the Woman's Hospital at Basel, 570 cases of ovarian tumor, and of these 59 presented torsion of the pedicle, an incidence of 10.35 per cent. Any torsion of the originally flat extended pedicle on its axis exceeding 180 degrees is regarded as torsion, whether nutritional disturbances are present or not. The condition occurred more frequently on the right than on the left side, the ratio being about 53.4 to 46.6. As regards age distribution, the incidence of torsion of the pedicle in the period between ten and twenty years was 10 per cent; between twenty-one and thirty years, 21 per cent; between thirty-one and forty years, 26 per cent; between forty-one and fifty years, 26 per cent; between fifty-one and sixty years, 12 per cent; and between sixty-one and sixty-five years, 5 per cent. The size of the individual tumors in this series of cases was given as the size of a fist in 28 per cent, the size of a child's head in 38 per cent, and larger than a child's head in 10 per cent; in 20 per cent the size was not given.

The clinical picture and differential diagnosis were not unusual. Immediate operation was performed in nearly 11 cases, the abdomen being entered through a Pfannenstiel incision. Symptoms of infarction appeared in 60 per cent of the tumors. In 20 per cent of the cases dense, heavy adhesions to the mesocolon, anterior abdominal wall, and omentum were noted. Only one of the 59 patients with torsion of the pedicle died, three days after the operation, from acute cardiac insufficiency.

In the second part of his article, the author concludes that it is impossible to demonstrate a single factor responsible for the phenomenon of torsion of the pedicle of ovarian tumor, as the number of factors involved is too great. In almost every case, a combination of several internal predisposing conditions and other factors were found, the relative significance of which varied in almost every case. Possibly experimental investigation will serve to determine the relative part played by each factor and its significance to the twisted pedicle more accurately than has been possible at this time from a purely statistical evaluation of the material available.

(PUETZ). EDITH SCHANCHE MOORE.

Bittmann, O.: Krukenberg Tumors (Ueber die Krukenberg-Tumoren). *Arch. f. klin. Chir.*, 1940, 198: 103.

Four cases of Krukenberg tumors are described in which secondary tumors were found in the pancreas, the hypophysis, or the cecum. The author believes that the Krukenberg tumors are not always metastases, but frequently represent primary tumors. They merit especial interest from the standpoint of tumor multiplicity. Both tumors, in these cases, grew slowly and supposedly regulated each other in their growth. The second tumor usually manifested itself when the first tumor was removed.

In animal experiments the survival period of white mice after the implantation of Ehrlich's adenocarcinoma was determined: survival was lengthened if the tumor was implanted in two places. Thus, it was determined that after a certain time one of the two tumors grows rapidly and the other tumor regresses. Furthermore, a primary tumor exercises a restraining influence on a second tumor of the same type which is implanted later. From these animal experiments, the author considers the Krukenberg tumors also as multiple primary and simultaneously com-

pensating tumors. Their relative rarity and their occurrence at younger ages than other ovarian carcinomas speak for their primary nature. To clear up this relationship, the author recommends that the surgeon always inspect the ovary in cases of gastro-intestinal tumors.

(EFFKEMANN). RONALD R. GREENE, M.D.

MISCELLANEOUS

Winkelstein, L. B.: The Effect of Thyroid on Sterility in Normal and Hypothyroid Females. *Am. J. Obst. & Gynec.*, 1940, 40: 94.

Sixteen sterile women, free of all pathological and infectious processes, were given desiccated thyroid extract in tolerance doses, regardless of the thyroid status of the individual. Nine of the entire group became pregnant; 7 remained sterile. Of the 9 in whom pregnancy occurred, only 7 carried the fetuses to viability, 2 aborting as the result of external trauma.

Five of those who became pregnant were suffering from true clinical hypothyroidism; the remaining 4 had unmistakable evidence of subclinical hypothyroidism. No evidence of thyroid dysfunction could be elicited in the group of patients who remained sterile. Therefore, the effect of thyroid, as an adjuvant or curative measure for sterility, was only demonstrable when a definite lack of thyroid was present. Likewise, when no deficiency in thyroid metabolism existed, the addition of this drug was of no apparent value.

Thyroid has a definite and valuable place in the treatment of female sterility only if hypothyroidism is present. It is of little or no value when normal thyroid function is present.

EDWARD L. CORNELL, M.D.

Davis, M. E.: A Clinical Study of Stilbestrol. *Am. J. Obst. & Gynec.*, 1940, 39: 938.

Stilbestrol, a new synthetic estrogen unrelated to the natural estrogens, has tremendous clinical possibilities. The oral administration of the drug can reproduce all the changes induced by the natural estrogens much more effectively and to a greater degree. It replaces the estrogenic action of the ovary. Many clinical conditions which are the result of a deficient ovarian activity or its complete cessation can now be treated easily and successfully. The treatment of disturbances of the menopause and of primary amenorrhea with stilbestrol is discussed in this paper.

The widespread clinical use of stilbestrol must await more adequate evidence as to its possible toxicity. Pharmacological experiments involving the long-continued administration of moderate amounts of this drug must be carried out to determine late undesirable effects. Careful clinical observations must be continued with the most guarded approach until such time as the lack of toxicity of the drug can be firmly established.

EDWARD L. CORNELL, M.D.

Huberman, J., and Colmer, M. J.: The Effects of Di-Ethyl Stilbene (Stilbestrol) on Menopausal Symptoms. *Am. J. Obst. & Gynec.*, 1940, 39: 783.

Seventy-seven menopausal patients were treated with a synthetic estrogen, "stilbestrol." Amounts necessary for complete replacement in the menopause varied from 0.2 mgm. to 5 mgm., with an average of 0.4 mgm., which were given hypodermically three times a week for six weeks. Some improvement was noted in 90 per cent of the cases; 62 per cent of them exhibited improvement with regard to the majority of all the symptoms.

In general, the results were more or less comparable to those of natural estrogen, viz.: relief of the menopausal syndrome, conversion of the "menopausal" into the "estrous" type of vaginal smear, and restoration of the normal appearance of a previously atrophic vulva or vagina.

Like natural estrogen, stilbestrol acts on the fallopian tubes, and influences peristalsis. Treatment should continue until results appear, and should be resumed if relapses occur.

In 20 instances the drug produced "vaginal bleeding." Patients should be warned about the possibility of pseudomenstrual bleeding when treatment is stopped, and reassured as to its meaning.

The drug is active whether given hypodermically, by vaginal suppository, or by mouth. The average suppository dose is 0.1 mgm., inserted twice a day; the average mouth dose is a 1 mgm. tablet each evening; and the average hypodermic dose is 0.4 mgm. three times a week. EDWARD L. CORNELL, M.D.

Fallas, R., and Rosenblum, G.: Endometriosis. *Am. J. Obst. & Gynec.*, 1940, 39: 964.

The authors conclude:

Adenomyoma becomes surgical at a later age than does pelvic endometriosis; this may be due to slower development of the symptoms in the uterine site.

The high incidence of fibromyomas and endometrial hyperplasia in the series of 260 cases reviewed would seem to add weight to a previously suggested common etiological factor in these conditions and endometriosis.

Some disturbance of menstruation is the most commonly found symptom. This takes the form of dysmenorrhea or some type of uterine hemorrhage. Retroposition of the uterus was present in more than half of the cases in which the position was noted. In external endometriosis the relief of symptoms was decidedly better accomplished by ablation of ovarian tissue than by conservative surgery.

A much larger percentage of pre-operative diagnoses is possible if attention is given to a more accurate history and if surgeons become as endometriosis-minded as the incidence of the condition deserves.

Extensive endometriosis involving structures which render excision extremely hazardous should be treated by removal of all ovarian tissue even in the younger age groups.

EDWARD L. CORNELL, M.D.

Custo, E. L.: The Production of Experimental Fibromas by Means of Injections of Follicular Hormone (Produzione di fibromi sperimentali per mezzo di iniezioni di ormone follicolare). *Clin. ostet.*, 1940, 42: 201.

Custo used for his experiments 34 female guinea pigs divided into various groups consisting of castrated and non-castrated animals, some of which were laparotomized in order to introduce a piece of silk thread into one of the uterine horns, and some of which were not operated upon. Some animals of each group served as controls or were treated only with injections of sterilized oil, while all the remaining ones were given each week an injection of dihydrofolliculin corresponding either to 1 mgm. or to 5 mgm. of the hormone. The treatments lasted from four to eight months. After an initial period of well-being, some of the animals, especially the castrated ones, showed signs of suffering, such as loss of appetite, weight, and hair, for which no cause could be detected; those who died belonged principally to the group that received the highest dose of folliculin.

The results of the experiments showed that it is possible to cause the formation of tumors in various parts of the body of the animals by means of weekly injections of follicular hormone; the tumors were found in the castrated as well as in the non-castrated animals, and the presence of a piece of silk thread in one of the uterine horns did not seem to have any decisive importance for the occurrence of tumor, since about the same formations were found in 6 animals carrying a silk thread and in 5 who had not been laparotomized. As this is only a preliminary report, the nature and the histological peculiarities of the tumors cannot yet be given exactly, but it can be stated that the tumors are similar to those described by the French authors who established their fibromatous character.

The tumors were found to show a predilection for the uterus, either in one of the horns or in the body in the vicinity of the bifurcation. They varied in size, form, and consistency, but in general did not reach the size of a small nut. Numerous tumors were also found in the region of the mesenteric lymph nodes; they were small, hard, round, or oval, and were of pinkish-white color. At times, a small tumor was found adhering to the intestinal wall, usually the colon. Another site of predilection was the greater curvature of the gastric wall. Finally, some tumors were observed in the liver and the spleen. In the latter organs, they appeared as small, rounded, whitish zones, which were clearly distinguishable against the reddish-brown tissue of the organ. No tumor formations were ever observed in the kidneys, the suprarenal glands, or the remaining organs or tissues. As far as can be stated at present, the tumors do not show any characteristics of malignancy. The very high doses of follicular hormone used and the prolonged duration of the treatment cannot be compared even to the highest therapeutic doses administered in some morbid manifestations in gynecological practice. RICHARD KEMEL, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Woodhouse, K. W.: Tubal Pregnancy. A Study of Cases with Emphasis on Diagnosis and on Blood Loss in Relation to Shock Symptoms. *Am. J. Surg.*, 1940, 49: 3.

The incidence of tubal pregnancy in the Guthrie Clinic and Robert Packer Hospital between June 30, 1927, and April 30, 1938, was 1:58, which is not an accurate proportion between extra-uterine and intra-uterine gestations in this community.

The idea that preëxisting tubal infection is an important cause of tubal pregnancy is borne out in this series. In 65.8 per cent of the cases a definite history or findings of pelvic inflammation were obtained. No data can be offered in support of or in disproof of endometrial tubal implants as a causative basis for tubal implantation.

There is no evidence in the literature or in these cases that race is a predisposing factor of any importance. Tubal pregnancy may occur at any time during the child-bearing age. The decade of greatest incidence is between the ages of twenty-five and thirty-five years, including 52.1 per cent of the cases in this series.

The average marital period in these cases was 9.74 years, which confirmed the idea that tubal pregnancy most frequently occurs following an extended period of marriage. Of the patients in this series, 78.6 per cent had been pregnant previously an average of 2.82 times; 21.4 per cent were nulliparas. In more than half of the 34 cases in which the interval following the preceding pregnancy was noted, the patients had a secondary sterility of more than three years' duration.

Tubal pregnancy recurs more frequently in patients with a previous ectopic gestation than in the general group of child-bearing women. Recurrence in this series was 4 per cent, which is in agreement with the majority of figures presented in the literature.

After a careful classification of the cases in this series, the number of tubal abortions and of rupture was found to be the same, 31 cases of each. The least frequent finding at operation was an unruptured tubal gestation (15 per cent in this series). No appreciable difference was noted as to the tubes involved; in 38 cases the right and in 35 cases the left tube was involved.

The diagnosis of tubal pregnancy is difficult and frequently missed. There was a diagnostic error in 32.8 per cent of these 73 cases.

Pain is the most constant symptom of tubal pregnancy; it was present in all but 1 case in this series. The type and character of the pain is roughly an index to the existing pathology. Referred pain does not occur or is very infrequent in unruptured cases.

Amenorrhea was present in 56.7 per cent of this series, averaging twenty days' duration. The average period of amenorrhea was longer in cases of tubal rupture than in cases of tubal abortion by ten days.

Abnormal external bleeding occurred in 81.4 per cent of these cases, beginning an average of 23.5 days before operation and continuing as a more or less uninterrupted flow of small amount in the majority of cases.

Subjective symptoms of pregnancy were infrequent. Nausea and vomiting occurred in 43 of 73 cases but usually followed pain of some severity. Symptoms and signs of syncope and shock were almost limited to cases in which tubal abortion or rupture was the finding. The average blood-pressure readings were lowest in cases of tubal rupture and essentially normal in unruptured cases. The converse was true in respect to the pulse rate.

Temperature readings vary considerably and depend on whether the patient is in severe shock or has had a recent hemorrhage. The temperature tends to rise moderately immediately following an intraperitoneal hemorrhage. This rise is usually not more than 2 or 2½ degrees.

Abdominal tenderness is an almost constant finding in tubal pregnancy, specified as absent in only 2 unruptured cases and in 1 case of tubal abortion in this series. Tenderness is most frequently general across the lower abdomen in cases with intraperitoneal hemorrhage, and localized to the quadrant involved in unruptured cases.

Rigidity was an infrequent finding in this series, present in only 9 cases of tubal abortion and rupture. Distention of some degree was found in 20 per cent of the cases reviewed.

Cullen's sign is rarely seen; it was noted in 1 patient in this group.

Pelvic tenderness on bimanual examination was specified as absent in only 1 case. The tenderness was most marked throughout the pelvis in most cases of rupture and some of tubal abortion, whereas it was usually localized to the side involved in unruptured tubal pregnancy.

A mass was palpated in 68 per cent of the cases in which the pelvic examination was described, least often in cases of tubal rupture. Forty-one per cent of this series showed softening of the cervix, enlargement of the uterus, or both.

The laboratory was of aid principally in the determination of leucocytes, the erythrocytic count, and hemoglobin. The Friedman test was positive in the 6 cases in which it was made in this series. Dilatation and curettage were used as a diagnostic procedure in 10 cases in this series to advantage. There is little real contraindication to their use.

No doubt there are occasional cases of ectopic pregnancy in which hemorrhage alone will not explain the shock manifested clinically, and in these

cases a neurogenic or vasogenic explanation of the shock picture is necessary; however, in this study there were no patients exhibiting marked or severe shock who did not have evidence of marked or severe intraperitoneal hemorrhage.

In this series of 73 cases, the mortality was 1.37 per cent, which compares favorably with other series reported in the literature.

J. Thornwell Witherspoon, M.D.

Albers, H.: Blood Volume and Water Balance in Pregnancy and the Puerperium (Blutmengen- und Wasserbewegungen in der Schwangershaft und unter der Geburt). *Zentralbl. f. Gynaek.*, 1939, p. 1377.

The total plasma volume and total erythrocyte volume of healthy, mature, well developed women weighing from 48 to 63 kgm. were determined by the dye method. For an average weight of 55 kgm. the average plasma volume was 2.25 liters, 4 per cent of the body weight, and the blood volume was 3.5 liters, 6.3 per cent of the body weight. These figures correspond to those usually given in the literature. This relationship changes during pregnancy. In pregnant women with an average weight of 58 kgm., the plasma volume was 3 liters or 5.2 per cent of the body weight and the blood volume was 4.5 liters or 7.7 per cent of the body weight. The increase in blood volume during pregnancy is, therefore, principally an increase in plasma volume.

Determinations of the blood and plasma volume in the same women before and after delivery showed that the blood volume after delivery is, on the average, 800 c. cm. less. Seven hundred cubic centimeters of this decrease is a decrease in plasma; therefore, a concentration of the corpuscular elements occurs. The total erythrocyte volume increases from 32 per cent before delivery to 37 per cent after delivery. Bleeding after delivery, therefore, has a different import from bleeding during pregnancy. Before delivery there is a plasma plethora which causes an increase in the blood volume of about one liter. Blood loss during pregnancy is more readily tolerated since fewer erythrocytes are lost, but after delivery the plethora no longer exists and bleeding represents a greater loss of erythrocytes. During the two weeks of bed rest the blood again becomes thinner. The total erythrocyte volume decreases accordingly. On this basis any intervention which causes a loss of blood should be delayed until the second day after delivery. In edema of pregnancy, other relationships occur than in normal pregnancy. The blood volume is only 5.3 per cent, and the plasma volume is 3.3 per cent of the body weight. Simultaneous observations were made on the blood volume, blood composition, and diuresis. In a normal pregnancy the increase in plasma volume is so greatly out of balance that, in spite of increase in the number of erythrocytes, a picture of oligocytemic hypervolemia results, while in edema of pregnancy there is fluid retention in the tissue, and the blood becomes thickened so that an increase in erythrocytes is apparent. The oligocytemic hypervolemia of normal pregnancy is changed into a relative polycythemic hypovolemia.

(Nothdurft). Ronald R. Greene, M.D.

Crabtree, E. G., and Reid, D. E.: Pregnancy Pyelonephritis in Relation to Renal Damage and Hypertension. *Am. J. Obst. & Gynec.*, 1940, 40: 17.

In a survey of 45 patients with pyelonephritis associated with pregnancy, evidence was produced by means of intravenous pyelography, intravenous phenolsulfonphthalein excretion, concentration of the urine test, and tests for retention of nitrogen which indicated that a high percentage of these patients suffer appreciable damage to their kidneys, which is demonstrable at from five to ten years after the infection. In the majority, adequate renal function is present at that time.

In the patient in whom there has been both toxemic and pyelonephritic injury, the prognosis is grave. Hypertension was found to be present in all the patients in whom there had been both toxemia and pyelonephritis (3 cases). Two of the 3 were dead at five years after the injury. Six patients with pyelonephritis showed blood-pressure readings above 150/90, associated with some evidence of renal deficiency at that stage of the natural history of the disease. Renal injury, as demonstrated in this group, consisted of injury to the conduction channels, pelvis and ureter, and to the cortex. When there is injury to the conducting channels, the stasis of urine produced by this condition may further injure the cortex, especially when infection is still present. Stone occurred in 5 of the 45 patients studied. Evidence of total renal deficiency was present at the time of examination in some proved unilateral cases. This finding suggested some other injury than bacterial invasion for the second kidney. The pyelonephritis of pregnancy should be looked upon as a progressive disease in many cases. Data have not yet been produced to indicate to what extent it shortens life. Some of the cases which were subnormal may have shown only the original damage and may now be in a stationary state. Sufficient evidence has been produced to indicate that the aim in treatment in pyelonephritis associated with pregnancy should be to minimize the initial injury and clear the infection as soon as possible.

Edward L. Cornell, M.D.

Tenney, B., Jr., and Parker, F., Jr.: The Placenta in Toxemia of Pregnancy. *Am J. Obst. & Gynec.*, 1940, 39: 1000.

A study of toxemia of pregnancy has been made with the purpose of correlating the placental pathology with the clinical and laboratory findings. Also a titration of the prolan of pregnancy in both the placentas and urines has been done. Sixty of the cases in this review have been studied by the medical service as well as the obstetrical.

From the results obtained, it is believed that the placental lesion (syncytial degeneration of more than

50 per cent of the small terminal villi) is an accurate indicator of the severity of the toxemia. The placental lesion is found in cases with no previous hypertension or kidney damage. It is present in many cases with previous renovascular disease. Therefore, toxemia is an entity in itself which may either appear with an undamaged kidney or may be superimposed upon previous kidney damage. It is present in many cases with previous renovascular disease. Albuminuria is the most accurate sign of the presence of placental damage.

A titration of the prolan of pregnancy, both of the placenta and of the urine, shows no standard difference between normal and toxemic cases. The medical classification of hypertension in pregnancy agrees largely with the placental findings, except in some cases with previous hypertension in which there was a very early placental lesion with no marked clinical signs of toxemia. EDWARD L. CORNELL, M.D.

Mudaliar, A. L., Nayar, A. S. M., and Menon, M. K. K.: Eclampsia: A Clinical and Biochemical Study. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47: 291.

The report of Mudaliar, Nayar, and Menon is based upon a study of 148 cases of eclampsia in the Government Hospital for Women and Children at Madras, India. Their studies extended over the two-year period of 1936 and 1937, during which time there were 8,564 confinements. Seasonal and variable weather conditions were found to bear no relation to the incidence of the eclampsia.

The greatest incidence occurred between the ages of fifteen and eighteen years; 93 of the patients were primiparas. Twelve cases were post-partum, 87 were ante-partum, and 57 were intra-partum. Sixty-two cases occurred at term, 24 at thirty-six weeks, 24 at thirty-four weeks, 6 at thirty weeks, 3 at twenty-eight weeks, and 1 at twenty-four weeks. Four patients had had eclampsia previously.

Edema, headaches, vomiting, visual disturbances, dizziness, epigastric pain, jaundice, and mental disturbances were the symptoms noted. In 98 per cent of the patients the blood pressure had returned to normal by the end of the first week. Only the values for systolic pressure are given. In 4 patients, the appearance of albumen in the urine was not observed until forty-eight hours after the development of convulsions. Elevation of temperature was noted in 63 per cent of the patients, and the pulse rate was more than 120 in 53 per cent. In this 53 per cent the condition was of greater severity than in the patients with slower pulse rates. Convulsions ranged in number from 1 to 73, the greatest number occurring ante partum. Death occurred in 13 cases, a mortality of 8.78 per cent.

Upon analyzing the various symptoms and signs in relation to the mortality rate, the authors concluded that cases presenting the combination of little or no albumen, no edema, moderate hypertension, multiparity, and the onset of eclampsia early in pregnancy, manifest the condition in its most severe form. Two patients remained undelivered at death. In all others, delivery was made from below. Among the total of 144 ante-partum and intra-partum cases, there were 36 still-births and 12 neonatal deaths. No mention is made of the fetal mortality in the post-partum group. Treatment was conservative in this series of cases, but for the past two years the authors have employed puncture of the membranes, with a reduction in mortality from 16.7 to 8.75 per cent. In 3 patients eclampsia developed in the thirty-fourth week; the condition was classified as "mild" and all of the patients recovered. The pregnancies were allowed to proceed to term, at which time normal, healthy infants were delivered. A fourth patient suffered a recurrence of symptoms and labor was induced by puncture of the membranes.

Clinically, these cases are classified into renal, hepatic, and mixed types. The criteria for each type are set forth. CHESTER C. DOHERTY, M.D.

Javert, C. T.: Hyperthyroidism and Pregnancy. *Am. J. Obst. & Gynec.*, 1940, 39: 954.

There were 18 cases of hyperthyroidism in 23,439 pregnant women, an incidence of only 0.076 per cent, which is a low figure in a seacoast city as compared with higher incidences in cities in the goiter district. With proper treatment, patients suffering from hyperthyroidism may safely go through a pregnancy, and sometimes even be benefited thereby. Hospitalization for evaluation and stabilization may be necessary several times during the ante-partum period. Iodine therapy is without danger even over long periods of time both during and after pregnancy. There is some question regarding the ill effects of iodine in adenomatous goiter, but its use in diffuse goiter is generally accepted. Therapeutic abortion is rarely indicated, although it was performed in 22 per cent of the cases, most of which were those of private patients.

Thyroidectomy was not performed during pregnancy. The optimum time for this operation is believed to be in the first post-partum year in the cases in which it is indicated, so that the effects of pregnancy on the gland are no longer present. However, thyroidectomy may be performed regardless of the pregnancy in the individual case, as shown by reports in the literature. The high incidence of toxemia of pregnancy (76 per cent) in the present study seems to be of significance, and raises the question of a common factor in toxemia and thyrotoxicosis. The increase in the basal metabolic rate in normal pregnancy may be due entirely to thyroid hyperplasia concomitant with the pregnancy, rather than to the active protoplasmic mass of the fetus. In the 18 cases, the rate was virtually the same in the second and third trimesters of pregnancy and immediately post-partum when the products of conception had been delivered; normally the basal metabolic rate returns to non-pregnant levels.

A probable basal metabolic-rate curve for normal pregnancy, based on the current knowledge of the test, is presented. Pregnancy may have an ameliorating effect on the hyperthyroidism. Only 1 case

was thought to have been aggravated by the gestation. Nitrous oxide, oxygen, and ether anesthesia were used for delivery, which was usually spontaneous and of short duration as most of the patients were multiparas. Local anesthesia is preferred.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Maizels, G.: High Puncture of the Membranes: A Review of 842 Inductions of Labor with the Drew-Smythe Catheter. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47: 237.

The author reviews his experiences with high puncture of the membranes as a method of inducing labor. The belief that this method is almost identical with artificial rupture of the membranes is fallacious. The two methods have this much in common: they both induce labor by contractions initiated by the passage of an instrument through the cervix and by the sudden reduction in size of the uterus. In the case of artificial rupture, this reduction is effected by the loss of the bag of forewaters and the subsequent escape of the liquor amnii, while the whole object of high puncture is to limit the loss of liquor amnii and to preserve the forewaters intact. This will, no matter what the indication, enable labor to take its normal course and avoid the risk of dry labor and ascending infection of the uterus. The only contraindications to high puncture are ante-partum hemorrhage and vaginal sepsis. For ordinary artificial rupture a high presenting part is a definite contraindication because of the danger of prolapse of the cord.

The technique is described in detail. The efficiency of the method was found to be enhanced by the preliminary use of Watson's castor-oil-quinine-pituitrin method the day before the puncture. Anesthetics and sedatives are not advised. After thorough vaginal preparation the cervix is exposed with a Sims' speculum. Dilatation is unnecessary. The Drew-Smythe catheter (a special S-shaped catheter), with stylet withdrawn, is passed up the cervical canal behind the head, between the uterine wall and the membranes. When the point of the catheter has passed above the child's head, the stylet is pushed home and the proximal end depressed; by so doing the distal end ruptures the membranes. The eyelets of the catheter are now in the amniotic cavity, and liquor amnii commences to flow. From half to one pint is drawn off. After the withdrawal of the catheter there is practically no further escape of liquor. If liquor amnii does not flow after the attempt to puncture the membranes the catheter should be guided round to the opposite side and a fresh site punctured.

Labor was induced in 842 cases by this method. Disproportion was by far the most frequent indication (490 cases). Toxemia accounted for 184 cases. The majority of the patients went into labor within four days; about 40 per cent were in labor in less than twenty-four hours. The length of the latent period was in no way related to the amount of fluid withdrawn. In 125 cases a second puncture was necessary. The rather long latent period and the occasional necessity for repeating the puncture (in 14.8 per cent) are not considered as drawbacks because the eventual results were so excellent. Labor failed to ensue in only 14 cases.

The average duration of labor was sixteen and three-tenths hours for primiparas and eight and four-tenths hours for multiparas. Nearly 90 per cent of the deliveries were spontaneous. Cesarean section was performed in 5 cases, being induced for disproportion in each case; 1 of the patients in the last group died.

The pyrexia rate was 3.4 per cent and the sepsis rate 1.3 per cent. One patient suffering from uterine sepsis died, but in the remaining 10 the infection was confined to the uterus and readily responded to treatment.

There were 7 maternal deaths, a gross mortality rate of 0.83 per cent, but 6 were due to severe toxemia or chronic nephritis and were in no way connected with the induction. In the seventh case the induction may have been responsible for the fatal issue by the possible introduction of sepsis.

There were 846 viable infants, including 8 sets of twins. The gross fetal mortality was 80 deaths (9.4 per cent). If one excludes the deaths due to accidents during delivery and acquired infant diseases, a corrected fetal mortality rate of 20 deaths (2.4 per cent) is obtained, but even all of these cannot be attributed to the method of induction. So far as can be ascertained the final correction of the fetal mortality was based on 11 deaths, which gave a rate of 1.3 per cent.

Prolapse of the umbilical cord occurred on 4 occasions, an incidence of 0.48 per cent, with 3 stillbirths. In all, the prolapse occurred late in labor.

There were 490 inductions (58.2 per cent) for disproportion in this series. The author is enthusiastic and believes that the results of the treatment of disproportion by high puncture of the membranes, as distinct from all other surgical methods of induction, including artificial rupture, are comparable with the best obtained after trial labor and have the additional advantage of a lower incidence of major operative interference. DANIEL G. MORTON, M.D.

Kinloch-McCollum, J.: A Case of Subcutaneous Emphysema Complicating Labor, with a Discussion as to Theories of Causation. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47: 309.

The occurrence of air in the subcutaneous tissues is an unusual and interesting complication of labor. The first case was reported by Simons in 1783. Since then many cases have been reported, including a case which the author reports. The total number in the literature is now 151.

There appears to be one common feature in all of these cases, namely, the bearing-down efforts of the patient, even though in many cases delivery has been relatively easy. Dystocia is common in such cases.

A long, dry labor, rigid soft parts, malposition of the vertex, and a slowly dilating cervix are commonly reported. While usually observed during the second stage of labor, the emphysema may occur in the first stage, but frequently it is not noticed until the delivery has been completed. If we hold that air gains access to the cellular tissues through a solution in continuity of the respiratory tract, and no other hypothesis is possible, the break may occur at any point where there is a lesion, or even in normal tissue when other factors are adequate.

Great exertion at delivery seems to be the only cause. It must be presumed that its origination is promoted by congenital anomalies in the respiratory ducts or abnormal liability to rupture of the pulmonary tissues.

Diagnosis does not offer any difficulty. Swelling which at first may be mistaken for edema has the characteristic crackling of air crepitation. Redness, cyanosis, or pallor, is not often present, but if it does appear, first in the neck or face, spreading to the chest and back, often to the arms, and less frequently to the abdomen and entire body, the patient presents a typical and often grotesque appearance. There is more or less discomfort or pain in the affected area; sometimes the patient has felt something burst or tear in the neck. Dysphagia, hoarseness, and aphonia have been observed, cough and dyspnea are common, and occasionally the patient's cardiac and respiratory distress is alarming. The swelling usually disappears spontaneously within seven to ten days.

As a general rule treatment should be expectant, the delivery being terminated when there is rapidly spreading emphysema, or when there is definite evidence of cardiac or respiratory distress. The condition has no direct harmful effect on the fetus. It is better to deal with the condition in most cases as one of obstetrical shock, and to treat the patient with great gentleness, rather than to perform immediate extraction. DANIEL G. MORTON, M.D.

MISCELLANEOUS

Jeffcoate, T. N. A.: Missed Abortion and Missed Labor. *Lancet*, 1940, 238: 1045.

The author presents a series of 55 consecutive cases of missed abortion and missed labor treated by a medicinal method of induction which was successful in 48 of the 55 cases reported. The object of this method of induction is to increase the sensitivity of the uterine musculature by the administration of estrogens. The present technique consists of the intramuscular injection of 2 mgm. of estradiol benzoate every eight hours for seven or eight days. On the fifth day, if abortion or labor has not occurred, 10 gr. of quinine hydrochloride are given each hour until 3 doses have been given. This is followed by 4 injections of 0.5 c. cm. of extract from the posterior lobe of the pituitary gland at hourly intervals. If this routine fails to produce evacuation of the uterine contents, it is repeated on the eighth day of the estrogenic administration. Stilbestrol may be used in place of estradiol benzoate; 2 mgm. are given orally three times daily, or 1 mgm. every four hours for seven or eight days. In addition, if necessary, quinine and pituitary extract are given as above.

The given rationale of the therapy depends upon building up the amount of estrogens in the blood following death of the placenta. The uterus then "is released from the all-powerful influence of progesterone and can react to estrogens by expelling the dead products of conception." Emptying of the uterus was free from complications such as uterine hemorrhage and infection.

WILLARD G. FRENCH, M.D.

Repetti, M.: Resistance of the Cesarean Scar in Relation to its Site (Sulla resistenza della cicatrice cesarea in rapporto alla sua sede). *Folia demograph. gynaec.*, 1940, 37: 159.

Repetti states that rupture of the uterus has become relatively rare because the pathological conditions which lead to it are now avoided by cesarean section. However, this preventive treatment has given rise to a new variety of rupture caused by dehiscence of the cesarean scar; according to recent statistics, this rupture occurs during subsequent labors in from 1 to 3 per cent of the women who have been submitted to the operation. Repetti describes a case of spontaneous rupture of the uterus which occurred during the beginning of labor in a woman who had undergone two cesarean sections, one of the lower segment and one of the fundus; the rupture corresponded exactly to the line of the scar of the fundus on which the placenta was inserted. This case presented ideal conditions for the comparative evaluation of the resistance of the cesarean scar during labor in these two locations.

There is no doubt that the technique used in cesarean section has considerable influence in determining the accident, but it is not easy to obtain good healing of the wound even with accurate suture: during the normal involution of the uterus, the muscle shrinks and after a few days the edges of the wound are at least partly separated and the entire process of healing is disturbed. As this takes place during the favorable postoperative course, conditions are even worse if infection arises, because secondary healing will result in the formation of a connective-tissue scar which will be less resistant than muscle. In addition, implantation of the placenta over the scar (and this occurs rather frequently) increases greatly the possibilities of uterine rupture, while rupture of the vessels in premature detachment of the placenta will cause the formation of a retroplacental hematoma which may exert a destructive infiltrating action on the muscular wall of the uterus. A number of predisposing causes have been cited to explain rupture in which no technical error in suture or the insertion of the placenta on the scar could be incriminated, and a nervous element has lately been injected into the discussion. Finally, the chances of rupture are increased, by the shortening of the interval between cesarean section and the

subsequent pregnancy. On the other hand, cases have been reported in which an imperfect scar has resisted successfully the assault of very prolonged labor and version, and also cases of rupture at a distance from the scar in which anatomical study has revealed perfect formation without connective tissue and with regeneration of the muscular fibers.

Lately, some authors have disagreed on the advantages of lower cesarean section and have expressed doubts concerning the solidity of the scar in this region, which is the usual site of uterine rupture in cases that have not been operated upon previously. However, statistics show that rupture of the scar of the fundus is much more frequent than that of the lower segment, and this becomes especially apparent in subjects who have undergone cesarean section on both the fundus and the lower segment. In the present case, the rupture occurred quite suddenly when the pains had just started. The surface of the rupture gave the impression of a wound that had been sutured recently and had been reopened after three or four days. The aspect and the thickness of the uterine wall at the site of the laceration were normal and the scar of the lower segment showed no changes and could hardly be recognized. The placenta covered the fundus scar nearly completely, and it is logical to think that its insertion and its villous infiltration of the site were one of the principal causes of the dehiscence of the scar, which was incapable of resisting the effect of the first contractions of the uterus. No other element seemed to justify the difference in the behavior of the two scars as both operations had been followed by a normal course of healing.

The prognosis after cesarean section must consequently be reserved and the patient must be kept under observation during subsequent pregnancies. The shock which accompanies rupture in these cases is extremely grave, and immediate intervention is indicated to save the life of the patient.

RICHARD KEMEL, M.D.

Stroink, J. A.: The Treatment of Patients with Hydatidiform Mole (Wie behandeln wir unsere Patienten mit Molenschwangerschaft?). *Nederl. Tijdschr. v. Geneesk.*, 1939, p. 2608.

The author reports 35 cases of hydatid mole and 12 cases of chorio-epithelioma which were observed between 1927 and 1938. After referring to the value of the Aschheim-Zondek reaction in diagnosis and the importance of the roentgen rays in therapy, he exhaustively considers the diagnosis and therapy of (1) the hydatid, and (2) the chorio-epithelioma. He comes to the conclusion that conservative treatment of hydatid moles does not increase the danger of chorio-epithelioma. All 28 women who were treated for hydatid moles recovered. With adequate control of the patient after abortion of the mole, a chorio-epithelioma can be recognized very early with the help of the Aschheim-Zondek test, and only in these cases can it be cured by roentgen therapy. In an advanced stage, combined operation and irradiation is indicated. The prognosis for chorio-epithelioma following a hydatid mole is, in this way, greatly improved. Metastases to the lung, vagina, and bowel can be caused to disappear by irradiation. In cases of chorio-epithelioma after abortion or parturition the chances are not so good as in such cases the diagnosis is usually made too late and then the presence of widespread metastases makes successful therapy impossible.

(H. BREUER). RONALD R. GREENE, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Porta, G.: Complications in the Urinary System after Rectal Surgery (Le complicanze dell'apparato urinario negli interventi sul retto). *Arch. ital. di urol.*, 1940, 17: 152.

The author presents an introductory discussion of the embryology of the cloaca, the urogenital septum, and the formation of the rectum, anus, and surrounding muscles. He reviews the anatomy, including the circulation and lymphatics, the latter being very important in the spread of infection. He then discusses the innervation and notes how often rectal irritation may cause symptoms in the bladder or other part of the urogenital apparatus, since these areas have rami from the spinal nerves in common.

He describes briefly the usual anorectal operations, particularly the incisions, dilatation of the sphincter, cauterization, removal of foreign bodies, and plastic operations for congenital defects, as well as resections and amputations for cancer.

There are various urogenital complications associated with this type of surgery. The bladder is most commonly affected, then the prostate, ureter, and kidneys. There is acute bladder retention which may occur immediately after anorectal surgery or several days later. The most common cause of this is trauma to the anorectal nerve terminations, which leads to a reflex spasm of the vesical sphincter. This fact is demonstrated on the attempt to use a rubber catheter to overcome the obstruction. Researches of Hill, Malcolm, and Roger have demonstrated that in from 30 to 50 per cent of these cases the retention is fortunately transitory in nature. Another complication is hyperemia of the bladder and perirectal and perivesical tissues as a result of vasomotor disturbances from reflex changes in the sympathetic system. This may be so severe as to cause a hematuria or may go on to a full-fledged cystitis. The latter is caused by the bacillus coli migrating in from the intestinal tract. With retention or congestion the cystitis tends to persist. It may be generalized or localized to the trigone.

Whipple has reported that in 200 surgically treated cases of rectal carcinoma the incidence of more or less grave cystitis was 100 per cent.

Next to the bladder, the prostate is most commonly involved by complications after anorectal surgery. There may be simple congestion, invasion by the bacillus coli, acute simple diffuse non-suppurative prostatitis, or acute suppurative disseminated miliary prostatitis. The latter is associated with fever and urinary retention. Or, a prostatic abscess may form there with severe pain and tenesmus, and a tendency toward spontaneous rupture. The author reports briefly 2 clinical cases of prostatic abscess which developed several days after ordinary hemorrhoidectomy.

The ureter may become inflamed and a ureteritis may develop. This is rarely reported as such. However, this may lead to pyelitis and pyelonephritis, which are usually due to the bacillus coli. The author reports a case of Razzaboni in a thirty-eight-year-old female who developed a pyelitis on the left side ten days after a radical Whitehead operation for hemorrhoids. Suppuration may develop in the renal parenchyma itself and may cause the so-called malignant carbuncle of the kidney, with all the symptoms of abscess formation. The perirenal tissues are important in the spread of such infections.

A very rare complication is oliguria with eventual uremia. This may depend on a reflex inhibition of renal function. Finally, pelvic phlebitis and thrombophlebitis, even with embolus, may occur. This involves particularly the perivesical plexus of the veins.

The author then concludes by discussing briefly the treatment of the conditions described. Retention of the bladder is treated by catheterization. Cystitis and pyelitis are treated with urinary antiseptics such as urotropin and mandelic acid. Sometimes renal pelvic lavage may be necessary. Abscess formation is treated according to the surgical principles of drainage. The general condition of the patient must be supported by such measures as hypodermoclysis to combat the toxemia.

JACOB E. KLEIN, M.D.

Austen, G., Jr.: Pelvic Lavage with Sulfanilamide in the Treatment of Renal Infections. *J. Urol.*, 1940, 43: 637.

Sulfanilamide, when given by oral or subcutaneous routes, is excreted by the kidney in concentrations which are effective against most of the organisms causing upper urinary-tract infections. The drug is excreted in both its free and conjugated forms. The higher the concentration of sulfanilamide in the urine the more marked is its bacteriostatic and bactericidal action. The concentration of the drug in the urine depends upon the amount administered, the urinary output, and the state of renal function. Satisfactory administration is not always possible because of untoward reactions such as anemia, leucopenia, and skin rash.

Because of the direct action of sulfanilamide on the organism causing the infection, the author believed that direct instillation of the drug into the renal pelvis would be of value especially when the drug was not tolerated by the usual routes, when renal function was reduced, when there was interference with drainage, and when an anatomical or pathological abnormality prevented high local concentration.

A soluble compound of sulfanilamide, prontylin maltoside (P. S. 386), was used in 10 cases. The drug

was well tolerated in all but 1. One bacteriological cure was obtained; clinical and bacteriological improvement was noted in 8 cases, and no improvement in 1. It was noted that the drug was absorbed from the treated pelvis and was excreted by the untreated kidney. The concentration of the drug in the treated kidney reaches a much higher level than obtainable with other methods of administration. It is felt that the direct pelvic instillation of the drug, although a method which has definite limitation, is a useful procedure in selected cases of renal infection. ANDREW MCNALLY, M.D.

Arezzi, G., and Marini, A.: Partial Nephrectomy (Sulla nefrectomia parziale). *Arch. ital. di urol.*, 1940, 17: 93.

The authors report on some experimental studies on the effect of the resection of a part of the middle region of the kidney between the two poles and restoration of the kidney structure after the excision. They review the literature and note that Siegelberg in 1897 was the first to perform a partial nephrectomy on a human being. With the introduction of modern methods of roentgen diagnosis the operation has received renewed interest. Lasio from 1935 to 1937 performed 12 partial resections of the kidney in the human being. The broad indications for partial renal resection are localized infection, tumors, lithiasis, and malformations.

The purpose of the present series of experiments carried out on dogs and rabbits was to determine whether there is danger of urinary fistula after partial resection; to evolve a hemostatic technique; to study the efficacy of the electric knife for the operation; to decide how much kidney tissue could be removed with impunity; and to decide whether the operated region acts as a locus minoris resistentiæ which invites infection in the presence of an artificially induced bacteriemia.

The authors review in detail the various techniques suggested in the literature for partial nephrectomy, the main purpose being to avoid hemorrhage. The electric knife has been recommended by some because of its hemostatic properties; however, there is a coagulation of the surrounding tissues which would tend to disturb renal function. For this reason most Italian surgeons prefer the scalpel.

The authors tried the various techniques on 20 rabbits and 18 dogs. Functional tests were done before and after operation and histological studies were carried out on the kidneys after operation. The effect of the electric knife was studied, and in several rabbits colon bacilli were injected into the veins before operation in order to ascertain whether this organism tended to localize in the kidney after operation. Detailed protocols are presented of all the experiments with illustrations, photographs, and photomicrographs to clarify the text.

The authors conclude that partial nephrectomy does not present any particular dangers as far as primary or secondary hemorrhage is concerned, provided that a suitable technique is used. There is no danger of urinary fistula. The common scalpel is preferable to the electric knife because it causes less scarring. The electric knife also has the disadvantages of retarding the healing processes in the parenchyma, causing necrosis of the renal tissue, and interfering markedly with the function in some cases. Also, the electric knife caused a marked increase in the azotemia after the operation. Partial nephrectomy performed in animals with one kidney is a comparatively benign procedure which carries with it no particular dangers, either early or late. The minimal amount of renal parenchyma found to be compatible with life was noted to be about one-fourth of the entire renal tissues. In the bacteriological experiments it was observed that the kidney which has been operated upon does not tend particularly to localize bacteria from a simultaneous and concurrent bacteriemia. JACOB E. KLEIN, M.D.

Pick, J. W., and Anson, B. J.: Retrocaval Ureter: Report of a Case with a Discussion of Its Clinical Significance. *J. Urol.*, 1940, 43: 672.

The authors present a case of retrocaval ureter which they encountered during routine anatomical laboratory dissection. The anatomy, embryology, and comparative anatomy, together with a complete review of the reported cases of postcaval ureter

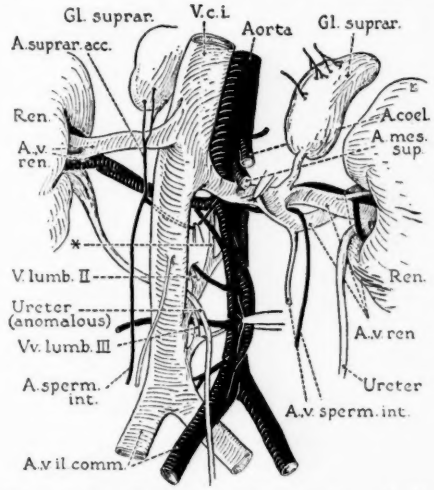


Fig. 1. Postcaval ureter and related structures (authors' case): male negro, forty-four years old. Three-fifths natural size. The aorta has been pulled aside to expose the lumbar arteries; the common stem (left) for the suprarenal and spermatic arteries has been drawn downward from its original position upon the renal artery. Abbreviations: gl. suprar., glandula suprarenalis; a. suprar. acc., a. suprarenalis accessoria; a., v. ren., a. and v. renalis; v. lumb., v. lumbalis; a., v. sperm. int., a. and v. spermatica interna; a., v. il. comm., a. and v. iliaca. communis; a. mes. sup., a. mesenterica superior; a. coel., a. coeliaca; v. c. i., v. cava inferior. * indicates communication with first lumbar vein.

in man, and the clinical aspects of the condition, are presented. A diagrammatic illustration of a post-caval ureter and related structures accompanies the article. D. E. MURRAY, M.D.

Grieco, F.: Two New Methods of Uretero-Intestinal Anastomosis (Due nuovi metodi di anastomosi uretero-enteriche). *Arch. ital. di urol.*, 1940, 17: 193.

Grieco has made a number of experiments on dogs and rabbits with two new methods of uretero-intestinal anastomosis. The first method consisted of transplantation of the ureter into the appendix and the second associated with the uretero-intestinal anastomosis a simultaneous temporary or permanent derivation of the urine through the skin.

In the first method, three silk sutures were passed through the wall of the ureteral stump from the lumen toward the outside. The serosa and muscular layer of the apex of the appendix were cut and dissociated enough to allow the introduction of the ureteral stump and a silk suture was passed through the mucosa and tied. By means of a straight needle one of the ends of this suture was passed through the appendicular lumen and the wall of the colon as high up as possible, and the ureteral stump was fixed to the treated appendicular zone with the three sutures. The appendix was invaginated a few centimeters and the invagination sutured to the ureteral stump; this was repeated twice; then the silk suture issuing from the wall of the colon was pulled out, which cut the mucosa of the appendix.

In the second method, the intestinal loop was treated according to the method of Coffey. A probe was passed into the stump of the ureter, and a suture inserted through its wall at some distance from its extremity; this fixed the ureter to the prepared zone of the intestine. The ureter was buried by suture of the intestinal muscular layer and of the serosa over it and the distal extremity of the ureter was sutured to the skin. With the use of this method, the cutaneous derivation of the urine lasted until necrosis of the ureteral wall and of the intestinal mucosa had established the necessary communication.

Unilateral anastomosis of the ureter with the appendix by the method of invagination and consequent elimination of the appendix has given good results inasmuch as the anastomosis has been shown to function well; the danger of infection of the peritoneal cavity was avoided and the contralateral kidney did not show any signs of suffering. The intervention may find its indications in cases in which there is no absolute necessity for complete exclusion of the bladder, as in injury to the right ureter and in uterine tumor involving the right ureter. Bilateral uretero-appendicular anastomosis has failed in every one of the author's experiments.

Unilateral or bilateral anastomosis of the ureter with the intestine, whether the small intestine, the colon, the sigmoid, or the rectum, has given good results when associated with a simultaneous temporary cutaneous fistula of the distal extremity of the proximal stump of the ureter. It has allowed nearly all of the experimental animals to live without incurring the usual complications, such as urinary infection, uremia, peritonitis, intestinal obstruction, ureteral obstruction, and urinary and fecal fistulas, which aggravate the prognosis of the various methods proposed or adopted by other authors up to the present time. This intervention allows exclusion of the urinary bladder during the same operation. In addition, the cutaneous derivation can be kept up until the danger of urinary stasis, reflex anuria, or ureteral stenosis, which is associated with the immediate postoperative period, has passed. It also allows closure of the cutaneous fistula by means of a simple, superficial, and absolutely innocuous repair operation at the opportune moment when the laboratory tests for renal function indicate it. This method has given good results even when the anastomosis has been performed in close vicinity to the kidney; this suggests that lesions involving the bladder and part of the ureter at the same time could be treated by this method. Finally, judging from the experimental results obtained, bilateral uretero-intestinal anastomosis with a temporary or permanent cutaneous fistula could replace advantageously the other uncertain methods which have hitherto been used.

The author admits that, although serious post-operative complications have not occurred in his series of experiments, the possibility of their occurrence as with the other methods is not excluded. However, the absence of complications under the circumstances justifies the preference for this method which does not require any special surgical dexterity or instrumentarium. RICHARD KEMEL, M.D.

BLADDER, URETHRA, AND PENIS

DeIllyés, G.: The Surgical Treatment of Diverticula of the Bladder. *Brit. J. Urol.*, 1940, 12: 104.

The necessity of surgical treatment for bladder diverticulum arises when there are disturbances of micturition. These become pronounced when the diverticulum grows large and difficulties occur in the passage of urine, or when infection develops, which cannot be treated as long as the diverticulum is there. Treatment becomes of greater importance when the ureter opens into the diverticulum, because then the renal pelvis will sooner or later become infected. However, there are diverticula of which the patient has no knowledge, and which are usually discovered accidentally during cystoscopic examination.

Conservative treatment by bladder irrigations, internal antiseptics, and continual catheterizing may be tried, but only temporary results can be expected, even in cases in which the emptying of the bladder is not hindered, or in which the obstruction can be treated as in stricture. However, when the obstruction presents difficulty in treatment, as in prostatic hypertrophy, the grave symptoms of a diverticulum will not be relieved by conservative

Fig. 1. The shelling out of the diverticulum.

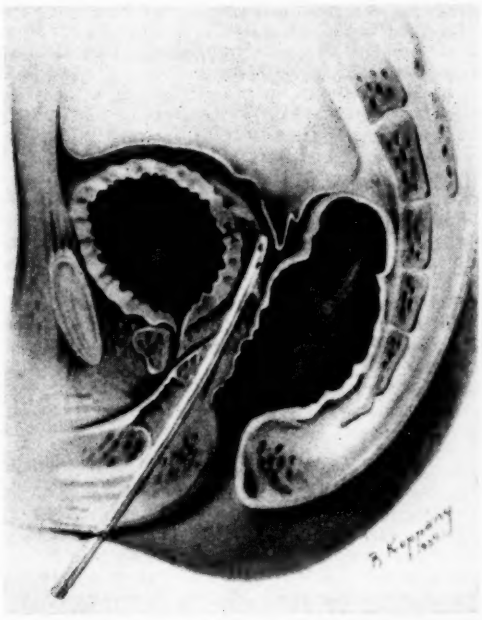


Fig. 2. Supplying the bladder wound with transperineal drainage after the extirpation of the diverticulum.

treatment. In these cases surgical treatment is indicated. The surgical technique used is as follows:

A high incision is made into the bladder. The pouch is irrigated and an elevator constructed for this purpose is passed into the pouch. The sides of the bladder incision are held tense by forceps. The wall of the bladder on the side of the diverticulum is freed by both blunt and sharp dissection. It is usually necessary to open the peritoneum horizontally if it is desired to expose the top wall of the bladder because the peritoneum is only loosely connected with the anterior and lower posterior walls of the bladder, but it is closely connected with the upper wall. Therefore, if the abdomen is opened by means of a horizontal incision at the site where the peritoneum closely adheres to the bladder, and a two-fingers' breadth of adherent peritoneum is left on the bladder, another horizontal incision can be made parallel to the former one. Two free edges are thereby created, and the peritoneal abdominal cavity is closed by sutures. The bladder is free as far as the seminal vesicles, or even lower, extraperitoneally. When, in this fashion, the depth at which the diverticulum lies has been reached, the wall of the bladder is cut with a straight scissors all the way to the opening of the diverticulum. The wall of the bladder being firmly held by forceps, the opening of the pouch is encircled by an incision through the entire thickness of the wall; the diverticulum is then separated from the outer wall of the bladder. The extremity of the metal elevator, which has been passed into the pouch previously, can be easily felt and serves as a guide to its depth.

The infected bladder and diverticulum unavoidably come in contact with the edges of the incision. For this reason, arrangements must be made for drainage; moreover, the sutures of the horizontal incision and corresponding sides of the bladder cut to the opening of the diverticulum will invariably let through some urine. In this case the soft parts are punctured with a blunt instrument. The lower edge of the os pubis must be located and a spot which is from one to two finger breadths to one side of the middle of the symphysis. When the end of the instrument is felt in the perineum, an incision the size of a buttonhole is made through which the instrument is pushed. A suitable drainage tube is applied and drawn into the wound behind the bladder.

After the operation for simple diverticulum, treated and drained as above, the bladder incision can be closed if provision is made for bladder drainage by an indwelling urethral catheter.

In 2 cases in which the diverticulum was closely adherent to the surrounding tissue and rectum, the neck between the pouch and bladder was cut through and the bladder closed, which resulted in a segregation of the diverticulum, which was treated from

above. One patient was seen a year later when the bladder wound was closed, and the diverticulum communicated to the outside through a small moist fistula above the symphysis.

In older patients in whom there is a prostatic hypertrophy with difficulty in emptying the bladder, a prostatectomy is performed, followed by extirpation of the diverticulum at the same sitting. This seems to be simpler than performance of the operation in two steps, for, if the prostatectomy is done alone, healing will be hindered and there will be danger from the infected diverticulum. If the diverticulum is operated upon first and the bladder is extensively freed there will be adhesions which will impede reopening and interfere with the proper procedure in dealing with the peritoneum.

In cases in which the ureter opens into the diverticulum or runs along the wall, the ureter should be cut near the wall so that later it can be transplanted into the bladder without tension.

JOHN A. LOEF, M.D.

Nesbit, R. M., and Gordon, W. G.: The Neurogenic Bladder. *Pennsylvania M. J.*, 1940, 43: 1261.

Neurogenic disorders of the bladder consistently fall into such well-organized patterns that they may be classified into definite groups which correlate consistently with the level and the extent of the nervous system lesion. There are four such groups. Each has characteristic symptoms and cystometric findings.

1. *The uninhibited neurogenic bladder.* The patient presents symptoms of frequency and urgency both day and night. Enuresis and precipitate micturition occur occasionally. Bladder sensation is normal. The capacity is less than normal. The patient has voluntary control of the external vesical sphincter. There is no residual urine. Uninhibited contractions of the detrusor muscle occur during the fill and are interpreted as a desire to void. This group is found in two main groups of patients presenting different etiological factors, the congenital and the acquired.

In the congenital group in which a normal integration of the cerebral inhibitory mechanism has not properly developed, a careful history reveals that these patients invariably have been bedwetters. Rational treatment should be toward depressing the bladder reflex, the overactivity of which is responsible for the difficulty. Stimulation of the sympathetics by the use of ephedrine would appear to be the obvious therapy, although no lasting benefit occurs from the continued administration of this drug.

Depression of the parasympathetic reflex by the administration of atropine has proved particularly effective.

The acquired uninhibited neurogenic bladder results from the loss of bladder inhibition due to the development of a central nervous system lesion, such as subtotal destruction of cerebral cortex, or subtotal destruction of spinal-cord pathways subserving the function of micturition, resulting in this bladder disorder. The loss of bladder inhibition may be seen in the following central nervous system diseases: hemiplegia, brain tumors, involvement of the ascending and descending cord pathways in multiple sclerosis, and pernicious anemia.

The uninhibited neurogenic bladder of acquired origin is less responsive to drug therapy.

2. *The reflex neurogenic bladder.* This condition is a result of profound disturbance in the suprasegmental reflex pathways or centers in the brain or cord, e.g., complete transection of the spinal cord. This removal of higher center control converts the bladder into a simple reflex organ.

The functional characteristics are: reflex and involuntary micturition and inability to initiate or cause cessation of micturition. Bladder sensation is lost. The residual urine varies from 1 to 3 ounces. Diffuse cord lesions producing subtotal destruction of the pathways usually allow a fairly satisfactory capacity of the bladder, however, a reflex bladder of small capacity, less than 100 c.cm. is the most common type found. The most important factors in reducing the capacity are infection and calculous disease.

Treatment of the reflex neurogenic bladder consists of the prevention or elimination of infection or calculous disease. Drug therapy has been unsuccessful in most of the cases.

3. *The autonomous neurogenic bladder.* This condition results from an interruption of the simple reflex arc which controls the bladder by involvement of the complete sacral cord, conus, cauda equina, or the sacral plexus. Normal sensation is gone; voluntary or reflex micturition is abolished. The detrusor tone is maintained, and the internal sphincter tone is normal or hyperactive. The bladder wall shows coarse trabeculation. Evacuation is by overflow. The bladder always contains residual urine.

The treatment is directed primarily toward reduction of the high residual urine. Many patients have been made satisfactorily continent by periodic forceful evacuation either by diaphragmatic force or by compression of the lower abdomen.

Other procedures are transurethral resection of the hypertrophic internal sphincter or reduction of the internal sphincter resistance by the performance of a presacral neurectomy.

4. *The atonic neurogenic bladder.* This condition results from interruption of only the sensory limb of the reflex arc, the motor arc being left intact. The atony is secondary to prolonged overdistention, due to lack of sensation and desire to void. The atonic neurogenic bladder is seen in tabes dorsalis, dorsal root involvement of pernicious anemia and multiple sclerosis, diabetes, syringomyelia, progressive muscular atrophy, and acute traumatic myelitis.

Functional characteristics are loss of sensation, complete atony of the detrusor mechanism, with great capacity of the bladder, and overflow incontinence. Voluntary micturition occurs only with straining, and a large amount of residual urine is

constant. Cystoscopic examination discloses a finely trabeculated bladder wall with a relaxed internal sphincter.

The treatment is directed toward two ends.

First, preservation of bladder tone. This is important in the atonic bladder of spinal shock. In early cases education of the patient to void periodically by straining and the Credé procedure will provide a highly satisfactory degree of continence with preservation of the muscle tone.

Second, reduction of the amount of residual urine in the advanced cases by:

1. Periodic evacuation of the bladder augmented by suprapubic pressure;
2. Drug therapy (an endeavor to stimulate detrusor activity by parasympatheticomimetic drugs. Mecholyl bromide, prostigmin, and gynergen have been used without success);
3. Constant drainage by urethral catheter or suprapubic cystostomy employed in bedfast patients whose incontinence and infection have been a menace to their existence; and
4. Neurectomy, which is done to lower resistance to the urinary outflow. Postoperative cystometric studies have shown no change in the bladder tone.

The treatment is summarized by the following principles:

1. Avoidance or removal of infection of the urinary tract.
2. Eradication of other irritative lesions.
3. Reduction of the residual urine.
4. Development of periodic voiding and complete or incomplete incontinence. JOHN A. LOEF, M.D.

Thompson, G. J., and McDonald, J. R.: Benign Tumors of the Urinary Bladder: Report of a Case of Neurofibroma. *J. Urol.*, 1940, 43: 831.

Neurogenic tumors that arise in the genito-urinary organs are exceedingly uncommon. The diagnosis of such tumors is important because of the relatively benign course of the majority of neoplasms of this type. The only reports of tumors of the bladder of the neurogenic type made heretofore are to be found in the German literature.

Steden (1923) reported a case of ganglioneuroma of the bladder in which ganglion cells were present. Hensch, in 1926, reported a case of neurofibroma of the bladder associated with generalized neurofibromatosis. The description of bundles of smooth muscle in this tumor together with the drawings leaves some doubt as to the nature of this tumor. Heidler (1928) described a case of neurofibroma of the bladder associated with generalized neurofibromatosis.

The clinical course in the case reported together with the physical findings was suggestive of a diagnosis of huge intravesical projection of the median lobe of the prostate gland. The correct diagnosis, however, would appear to be neurofibroma arising from the plexus of nerves which supply the posterior surface of the bladder near the prostatic juncture. The tumor was much larger than the two neurofibromas and the ganglioneuroma of the bladder which were reported previously in the literature.

GENITAL ORGANS

Gutierrez, R.: The Changing Conception of Cancer of the Prostate. *Am. J. Surg.*, 1940, 48: 330.

The author reviews statistics on the incidence of cancer of the prostate. Until recently this malady was faced by urologists with a defeatist attitude. In the past few years, however, the outlook has changed.

The author divides prostatic carcinomas into three therapeutic groups:

1. Silent or occult cases in which a small nodule of cancer exists without symptoms or metastases. For these, he advises perineal prostatectomy.
2. Circumscribed cases. In this group urinary symptoms have appeared; the prostate, however, is not fixed, and the lesion is still circumscribed to the gland and has not extended beyond the limits of the capsule. These, he states, are still operable.
3. Diffuse cases, carcinosis. These comprise 90 per cent of the total cases. The process has extended beyond the capsule, or frank metastases are present. The patients should be relieved of their painful symptoms and of urinary obstruction by transurethral resection. After the operation they should receive deep x-ray treatment to control the metastases and to relieve pain and urinary distress.

Gutierrez advocates yearly rectal examinations of all males more than fifty years of age. He believes the prognosis for a five-year cure is greatly improved under this newer conception of management. THEOPHIL P. GRAUER, M.D.

Stevens, A. R., and Barringer, B. S.: Sarcoma of the Prostate. *J. Urol.*, 1940, 44: 83.

Case histories of 16 patients with sarcomatous prostatic growths diagnosed either clinically or by microscopic section are reviewed by the authors in an attempt to clarify existing views on an uncommon, yet important disease entity. While 4 cases are presented with favorable results, the larger group represents a discouraging record in which diagnosis was made late in the disease with a rapid down-hill course, temporarily impeded in a few instances by x-ray therapy.

A simple and useful pathological classification based on the origin of the tumor is propounded:

1. Liomyosarcoma and rhabdomyosarcoma, taking origin from the musculature of the prostate. These two tumors are much alike in growth and clinical manifestation.
2. Lymphosarcoma, from the lymph tissue in the prostate. This was formerly a disputed entity, but is now generally recognized.
3. Sarcoma of an undetermined origin—spindle, fibrous, myxomatous, round-cell, and giant-cell sarcomas.
4. Clinically, a fourth group, not sarcomatous but representing anaplastic carcinoma, is considered

because it has various features resembling sarcoma and is often mistaken microscopically for lymphosarcoma.

In 4 cases of sarcoma, the initial diagnosis was prostatic abscess and incision and drainage were attempted. Of 5 cases of myosarcoma, proved microscopically, 3 were diagnosed as benign hypertrophy and subjected to prostatectomy. The less malignant sarcomas, especially myosarcoma, may suggest benign prostatic hypertrophy in older men, while the most malignant are found in younger individuals and the diagnosis may be inferred by the age, brief history, great size of the gland, elasticity, and perhaps irregularity of contour without induration, as well as the presence of a suprapubic mass connected with a prostatic tumor. Loss of weight and cachexia frequently occur.

A differential diagnosis must be made from abscess, calculus, cyst, and carcinoma of the prostate. The diagnosis of a large bladder tumor and retrovesical sarcoma may be aided by the use of the aspirating needle, aspiration biopsy, and an x-ray therapeutic test, in addition to the usual urological armamentarium.

In practice, two groups of cases are recognized: those not diagnosed until after prostatectomy for supposed hypertrophy and usually of a low degree of malignancy, and the unusual and large tumors of a high degree of malignancy. Experience has shown the superior value of irradiation over surgical procedures in such instances.

ARTHUR H. MILBERT, M.D.

Counseller, V. S., and Bedard, R. E.: Sarcoma of the Prostate Gland. *J. Urol.*, 1940, 43: 836.

Sarcoma of the prostate gland is admittedly a rare disease. There have been reports in the medical literature of some 160 verified cases. The most common lesion reported has been round-cell sarcoma, which comprises approximately one-quarter of the cases. The next in frequency is spindle-cell sarcoma. There have been 12 cases of lymphosarcoma, including those of Coupland, Kaufmann, Conforti and Favento, Quinby, Symmers, Zeno Cid and Ercole, Mason, Ferguson and Stewart, Cole and Martin, and Smith and Torgerson. Liomyosarcoma, rhabdomyosarcoma, angiosarcoma, and fibrosarcoma have been reported also.

The incidence by age has varied tremendously. The youngest patient was a newborn infant and the oldest was aged eighty-eight years. Almost half of the patients have been under the age of twenty years and the majority have been under the age of forty. The duration of life of the patient subsequent to the diagnosis of sarcoma of the prostate gland is approximately nine months, regardless of treatment. The average life of patients less than thirty years of age who have this lesion is even less than nine months, and the cytological type of sarcoma does not appear to alter the prognosis.

The best results with irradiation were reported by Bumpus, who presented 5 cases in 1925. There have been 9 verified cases of sarcoma of the prostate gland at the Mayo Clinic up to the present time, 5 of which were reported by Bumpus before the American Urologic Association in 1925. The 4 additional verified cases have been encountered between the years of 1925 and 1938.

In our hands, the most favorable results in the treatment of sarcoma of the prostate gland have been achieved by partial prostatectomy followed immediately by the use of radium and roentgen rays.

Rea, C. E.: A Further Report on the Treatment of the Undescended Testes by Hormonal Therapy at the University of Minnesota Hospitals. *Surgery*, 1940, 7: 828.

Despite previous reports showing a high incidence of successful results following the treatment of undescended testes with gonadotropic substances, often up to 75 per cent, the author has noted successful results in not more than 20 per cent of two series of cases of retained testes treated at the University of Minnesota Hospitals. Of 36 undescended testes treated, 7 descended, representing 19.4 per cent success. There was no uniformity of dosage or length of treatment but all patients received at least 3,750 units of substance like that obtained from the anterior lobe of the pituitary gland during their courses of treatment.

It is interesting to note that several of the patients received 500 units of the hormonal substance intramuscularly every day for ten days, and 1 patient, nine years of age, received a total of 15,000 units of antuitrin-S over a period of four and one-half months without descent of inguinal ectopic testes. The author noted no untoward reactions in any of the cases which were given larger doses than a previous series of 36 cases. Emphasis is placed on the absence of excessive genital growth in any of the patients under treatment.

It is impossible to give a final estimate of the value of gonadotropic substances in the treatment of ectopic testes at the present time, a primary factor being the inability to evaluate the incidence of spontaneous descent. Further, it must be determined whether endocrine therapy causes descent only of those testes which would descend without therapy at the time of puberty. Hormonal treatment makes it possible to differentiate between those testes which require surgery because of mechanical obstruction to descent and those that do not.

The author believes that treatment should be deferred until the patient is from nine to eleven years of age, since the testes do not grow grossly or microscopically until then (Wangensteen) and also since it is possible that spontaneous descent may occur. At the present time, the therapeutic régime consists of the administration of anterior-pituitary-lobe-like substance in doses of 500 rat units per cubic centimeter every day or every other day for 10 injections. If no results are obtained, the patient is given one month's rest and a similar course of therapy instituted. If no results are then noted, an additional

rest of from three to six months is ordered, for possible delayed descent. If unsuccessful, orchiopexy is performed. The author believes that the danger of precocious puberty is more apparent than real following the use of gonadotropic substance, if the patient is carefully watched.

Spontaneous descent or descent following the use of gonadotropic substance in cases of true undescended testes is a rare occurrence in the experience of the author. At this clinic, every case of true undescended testes upon which an orchiopexy was performed showed evidence of mechanical arrest of the gonad. ARTHUR H. MILBERT, M.D.

Gilbert, J. B.: Studies on Malignant Tumors of the Testes. Differential Diagnosis of Clinically Obscure Tumors: 4 Cases and a Review of 122 Cases from the Literature. *J. Urol.*, 1940, 43: 722.

The basis of this report consists of 122 cases taken from more than 7,000 cases of tumor of the testes analyzed by MacCarthy, and 4 previously unpublished cases. These tumors occurred in normal or smaller than normal-sized testes and constituted about 1.5 per cent of the total number.

The average age of these patients was thirty-two and one-half years. Forty-eight tumors occurred in the right testis, 35 in the left, and 2 were bilateral. A history of trauma was obtained in 12 per cent.

The tumor was unicellular in 36.5 per cent. Eight of these patients were known to be alive for an average of eighty-two and seven-tenths months.

In 71 patients the tumor was teratoid in type. Of these, 29 had teratomas and 2 of these are known to have survived for ten years; 42 had chorio-epitheliomas and only 1 of these was alive and well more than six months after operation.

In the clinical diagnosis, scrotal disease was evident on first examination in only 59 patients. Tumor of the testis was diagnosed in 32, while the diagnosis in the remaining 27 included all possible scrotal conditions. In 26 cases with abdominal metastases the condition was believed to be intra-abdominal, the primary tumor remaining unsuspected. The remaining 41 cases were considered to be primary disease of the thorax, head, neck, and extremities.

Hormone assays aided in the diagnosis in 21 of 53 cases since 1932.

Simple orchiectomy was performed on 67 patients, in 24 of whom metastases were already present. Five radical operations were performed, but the results were not stated. Pre-operative and post-operative radiation therapy was given to 40 patients. ANDREW MCNALLY, M.D.

MISCELLANEOUS

Batchelor, R. C. L., Lees, R., and Thomson, G. M.: Sulfonamide Treatment of Gonorrhea: Results of Treatment. *Brit. M. J.*, 1940, 1: 961.

The author reviews the results in 810 male and 129 female patients with gonorrhea treated with sulfanilamide, uleron, albucide, M 541, and sulfapyridine. All the cases were diagnosed and controlled bacteriologically, principally by the examination of smears, but by culture also in doubtful cases.

A definition of terms employed in this study follows:

Drug resistance—The phenomenon in which the disease is partially or completely unaffected by the drug.

Relapse—A return of symptoms and signs with positive bacteriological tests.

Return Case—The case of a patient who has been discharged as cured or defaulted and who has subsequently returned to the clinic.

Defaulter—Any patient who ceases to attend the clinic before all tests of cure are satisfactory.

THE ROUTINE MANAGEMENT OF GONORRHEA IN THE MALE

Before treatment, a full clinical examination is made and smears of the urethral discharge are examined by the Gronis method. If doubt exists as to the diagnosis, cultures are made. Administration of the drug is started as soon as the diagnosis has been established. No irrigations are used.

Points emphasized in the treatment are:

1. Exact dose prescribed must be taken.
2. The drug must be taken at the prescribed intervals.
3. Tablets must not be given to another person.
4. Enough of the drug is supplied to last until the next visit.
5. Observation must be regular and at frequent intervals—every two days during chemotherapy, then once a week until cure is established.

Tests of cure are carried out during the latter part of the observation period. The period of observation after cure should be not less than three months. The test of cure consists of repeated urethral and prostatic smears, the passage of large bougies, urethroscopic examinations, provocative injections of gonococcal vaccine, and repeated gonococcus fixation tests.

Sulfapyridine is greatly superior to other drugs of the series; it produces a more rapid curative effect, its toxic effects are less severe, drug resistance is less common, and complications are similarly low, being 13.7 per cent in the sulfanilamide series and 4 per cent in the sulfapyridine series.

Drug resistance was observed in 116, 32.4 per cent, of 358 cases treated with sulfanilamide and in 24, 5.7 per cent, of 417 cases treated with sulfapyridine. Conclusive observations on the cause of primary drug resistance cannot be given at this time.

If insufficient dosage of a sulfonamide is employed for even a short time, the gonococcus quickly becomes resistant to all sulfonamides. This drug resistance is retained for several weeks or months. It appears essential to give large doses of all sulfonamides at the outset and reduce the dose after a high blood concentration has been obtained.

THE ROUTINE MANAGEMENT OF GONORRHEA IN THE FEMALE

Sulfonamide treatment of gonorrhea in women is discussed separately. In all cases smears of the urethra, cervix, Bartholin glands, and vagina are taken. In case of doubt secretions are cultured. Tests of cure are conducted over a period of three months.

Sulfonamide is given immediately after the diagnosis has been established. The doses tolerated are less than in the male cases.

The percentage of cure is higher with sulfanilamide than with sulfapyridine, the latter, however, showing a lower incidence of complications and involving less drug resistance.

Relapse occurred in 1 patient treated with sulfanilamide and 1 treated with sulfapyridine.

OTHER SULFONAMIDES

Uleron (Bayer) gives its best results in delayed therapy only. It has a tendency to damage the peripheral nerves.

Albucide (Schering) is a modification of sulfanilamide given with a view to reducing toxicity. Its curative action on the gonococcus is much weaker than sulfanilamide.

M 541 (I. C. I.), or sulfanilamide-ethyl-sulfonate, is a compound of low toxicity but of very feeble curative power.

JOHN A. LOEF, M.D.

Laird, S. M.: Late Relapse Following Treatment of Gonorrhea with Sulfapyridine. *Brit. M. J.*, 1940, 1: 967.

The author, in a study of 162 cases of urethritis in the male, treated with from 9 to 30 gm. of sulfapyridine given at the rate of 3 gm. a day in divided doses, reports a recurrence of symptoms in 25 cases after a clinical cure had been achieved. The evidence in 13 of these cases indicated reinfection, and thus the incidence of relapse was 12 of 162 cases, a rate of 7.4 per cent. Six of these occurred during the first month and are classified as early relapse, which leaves 6 cases of late relapse, or a rate of 3.7 per cent.

The criteria of clinical cure used in this series were: the absence of urethral discharge when examined at least two hours after urination, the finding of clear urine in both the first and second glasses, urine free from shreds and débris, and the absence of symptoms.

The clinical findings of relapse were variable. Acute urethritis with gonococci demonstrable in the urethral pus may occur, while in other cases only a scanty discharge containing pus and epithelial cells accompanied by clear urine is found. In still other cases the relapse takes the form of an acute complication.

In 4 cases of relapse a closed focus of infection was discovered and ultimate cure was obtained only after these foci were eradicated.

In 2 cases the first cure followed the administration of only 9 gm. of sulfapyridine, the subsequent cure being accomplished with further adequate doses of sulfapyridine.

The prophylaxis of late relapse includes adequate sulfapyridine therapy combined with urethral irrigations. In addition, it is important to enlist the coöperation of the patient by avoidance of sexual excitement and ingestion of the tablets.

These methods combined with thorough tests of cure and detailed chemical and bacteriological study of the urethra and the associated structures can do much to reduce the incidence of relapse.

JOHN A. LOEF, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Ingelrans, P., and Laine, E.: Osteochondritis Dissecans (L'ostéochondrite disséquante). *Rev. d'orthop.*, 1939–1940, 26: 645.

Ingelrans and Laine note that osteochondritis dissecans is a form of foreign body of the joint. It is a unique type, as the foreign body is a true sequestrum detached from the epiphysis which secondarily enters a joint cavity that is apparently normal; other foreign bodies arise in diseased joints.

In a case of osteochondritis dissecans recently examined, there was no history of trauma; the patient was a man twenty-four years of age. For seven years he had occasional pain in the left knee but in the last two weeks the pain had become increasingly severe. On examination, the knee was not swollen and the movements of the joint were normal except for a slight limitation of flexion. On palpation, severe pain was elicited by pressure at a point on the internal condyle in front of the point of the patella. Roentgenographic examinations had been made previously on several occasions, the first roentgenogram made seven years previously showing only an area of decalcification on the axial surface of the internal condyle. The last roentgenogram showed the typical picture of osteochondritis dissecans, with a fragment about 2 cm. in length definitely separated from the bone. The rest of the joint was normal. This fragment was removed, with complete relief of pain. The function of the joint three months later was normal and the patient could walk with ease.

This case was typical of osteochondritis dissecans, which usually occurs in young men living an active life; yet it was not associated with any definite history of trauma to the joint. The symptoms also were typical; they were pain in the joint, not severe and not definitely localized. There may be a feeling of insecurity in the joint which interferes with comfortable walking, but there is little if any limitation of movement. The elicitation of severe pain by pressure on a definite, well localized point is characteristic of osteochondritis dissecans. There may be an associated muscular atrophy. The roentgenographic examination in the earlier stages shows a subchondral niche, enclosing a sequestrum more or less definitely separated from the bone. The definite separation of the sequestrum and its appearance as a foreign body in the joint cavity may be followed roentgenographically. As this occurs, the pain in the joint becomes more severe and more constant, and hydrarthrosis becomes more marked and develops more frequently. There may also be more definite interference with movements of the joint, even occasional complete blocking of the joint, which is only temporary. When completely separated from the bone, the foreign body is often easily perceived, often by the patient himself. In many cases of osteochondritis dissecans, the complete clinical picture of a joint foreign body does not develop, but the symptoms remain those of a chronic arthritis or a meniscal lesion without marked limitation of joint movements or blocking of the joint, or marked hydrarthrosis. Osteochondritis dissecans usually affects the knee, rarely the hip or the shoulder.

The treatment consists in the operative removal of the foreign body. Microscopic examination shows it to consist of three layers: normal cartilage on its articular surface; a central layer of spongy bone, entirely necrotic, not containing any normally staining bone cells; and a third layer of newly formed fibrocartilaginous tissue. The last layer is present even if the sequestrum is not entirely detached from the epiphyseal bone. The pathogenesis of osteochondritis is obscure; the synovial fluid apparently plays some rôle in the formation of the sequestrum, but the cause of the original lesion is not known.

ALICE M. MEYERS.

Glissan, D. J.: Deformities Affecting the Lower Radial Epiphysis. *Australian & New Zealand J. Surg.*, 1940, 9: 337.

The author calls attention to the fact that the original description of Madelung's deformity covered several diverse conditions, but it is likely that it referred particularly to a condition which had as its main feature forward projection of the distal end of the radius. Forward deviation of the lower end of the radius is rare. It may be due to a fracture of the shaft of the radius or to a growth disturbance of the epiphysis. The cause of the latter type is obscure. The radius appears to be actually lengthened as the result of overgrowth.

In a second and contrasting deformity affecting the lower radial epiphysis the radius is shortened. The hand is displaced radially and the head of the ulna is prominent. The underlying pathology is a slowing down and premature cessation of growth at the distal radial epiphysis. The condition is more common than a true Madelung's deformity. The deformity is unsightly and leads in some cases to such weakness and disability as to cause the patient to undergo operation readily. The uniformity in all the features of this deformity suggests a specific cause, but none is known. The clinical history which is usually obtained shows that the initial trauma is a slight one. A precisely similar condition, described by McFarland, affects the lower tibial epiphysis. In the treatment of the deformity at the wrist the author shortens the ulna with very satisfactory results. The operation is done with the reservation that a future final shortening may be necessary when the growth of the ulna has ceased.

The third deformity discussed is the rare anomaly of complete medial displacement of the hand. In the

author's case the hand was carried at a right angle to the forearm and the articular surface of the radius was directed exactly medially. An infectious cause was a possibility in this case because there were signs of an old infection in the lower part of the forearm and evidence of an old osteomyelitis near the knee joint. A diagram of the template used for the osteotomy to bring the distal end of the radius into its normal position is presented.

Roentgenograms showing the deformities discussed and some postoperative results are included.

ROBERT P. MONTGOMERY, M.D.

Dubau, R., and Bolot, F.: Remarks on 11 Cases of Subastragaloid Tuberculosis in Young Adults (Sur onze observations de tuberculose sous-astragalienne chez l'adulte jeune). *Presse méd.*, Par., 1940, 48: 519.

This article comes from the surgical tuberculosis service of the French army at the Percy Hospital. The calcaneo-astragaloid joint (talocalcaneal articulation), is composed of anterior and posterior parts, which have separate synovial linings and which are separated by the interosseous ligament. The main purpose of this article is to show that tuberculous involvement of the posterior part of the joint has a benign prognosis and responds to simple treatment. This is not true of tuberculous involvement of the posterior part when it is complicated by an osteoarthritis of the tibiotarsal joint (talocrural articulation), nor of the anterior part when there is serious disease of the transverse tarsal articulation (Chopart). Of the 11 cases under discussion 5 showed involvement of the anterior subastragaloid and the internal part of Chopart's articulation, 2 of the posterior part of the subastragaloid joint, and 4 of the posterior subastragaloid and the tibiotarsal (talocrural joint) joints.

The diagnosis of a tuberculous subastragaloid arthritis depends on a clinical picture usually in an individual who has had tuberculosis in other parts of the body. Of 30 patients with tuberculosis involving the foot, 21 had evidence of the disease elsewhere. In the 11 cases discussed in this article, 9 had had evidence of tuberculosis in other parts of the body. The lesions in the foot develop slowly and give a characteristic roentgenological appearance. Positive evidence of the nature of the disease is the demonstration of tubercle bacilli in the pus from fistulas, in other parts of the body, in the sputum, and in aspirated stomach secretions. The authors place great confidence in this last means of finding the bacilli, even when the sputum is negative and when the roentgenograms of the chest appear normal. In the 11 cases, the tubercle bacillus was found 5 times in pus from a local abscess, twice in pus from an abscess elsewhere in the body, twice in the sputum, and 3 times in aspirated stomach contents. The objection has been made that bacilli are apt to be found in the stomach contents of a patient placed in close contact with other patients who are tuberculous, but the authors cite the case of a Tunisian who was in contact for one and a half years, who constantly had negative skin tests and never showed tubercle bacilli in his stomach contents.

The treatment is of a general nature along with orthopedic immobilization. In the event this does not give satisfactory results, an attempt must be made to salvage as much of the foot as possible. In the presence of involvement of the anterior subastragaloid joint, a midtarsal amputation was done in 5 cases, and secondary amputations were necessary in 4 cases; in each the result was satisfactory. When the posterior part of the joint is involved with the tibiotarsal joint, astragalectomy may give good results, although the authors believe that the astragalus should be sufficiently necrosed to form a sequestrum. When the posterior part of the joint only is involved, simple immobilization should be sufficient, but in 2 cases astragalocalcaneal ankylosis was necessary.

ADRIEN VERBRUGGHEN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Rostock, P.: Indication for Operation on the Knee Joint (Indikation zur Eroeffnung des Kniegelenkes). *64 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1940.

The operative removal of a foreign body in osteochondritis is recommended not only when the body is loose but also when the demarcation process is visible in the roentgenogram. The earlier operation is performed, the better are the end-results. The roughened edges of the defect from which the joint mouse came should be smoothed. The joint cartilage must be removed by operation in the majority of cases, which is done with regard to the conditions present and the site of development of the tumor in the synovia. Degeneration of the patellar cartilage is assumed to be frequent. When conservative treatment by various physical methods does not lead to a satisfactory end-result, operative interference is advised for degenerative cartilages. Severance of the meniscus tissue may take place slowly when due to degeneration or rapidly when due to an accident causing a tear. If the tear is located in a vascular area the meniscus will heal. If the tear is in an avascular area it will not heal, as seen in tissue separation due to degeneration. The tear is ordinarily first immobilized in a cast with the possibility of spontaneous healing. If there is any question of the tear being due to degeneration, the operation is indicated to remove the loosened piece of cartilage. The diagnosis of meniscus tears is difficult. A very accurate history, a careful physical examination, and a roentgen study of the joint by means of a contrast medium are necessary. If the previous evidence is positive more evidence will not be needed for operative intervention. In questionable cases Payr's S-incision is recommended, otherwise a muscle-splitting incision on the inner side of the joint should be made without division of the lateral ligaments.

According to statistics the end-results are not satisfactory in 20 per cent of the cases. After

removal of the meniscus regeneration takes place, which ordinarily brings about an almost complete and normally formed meniscus. The results of each interference on the knee are important from the standpoint of observation and the corresponding treatment in the so-called sensitive knee joint. The infiltrative or fibroplastic condition can be healed by conservative means, but in the granular condition the excision of the pathological capsule is necessary. Interference will also be necessary in the treatment of stubborn residual pathology of the knee joint. Arthrotomy may be indicated. It should be considered only when all diagnostic aids are exhausted; the diagnosis is made by this means in order that the proper treatment may be carried out. Sprains and partial tears of the lateral ligaments of the knee joint ordinarily heal following conservative measures. In complete tears, the lateral ligaments must be repaired operatively. This repair should be done by means of braided silk or fascia. In injuries of the crucial ligament the posterior crucial ligaments ordinarily heal spontaneously because of the good vascular supply. Tears of the anterior crucial ligaments from their origin at the tibia do not respond well to operative interference. The vascular supply to the middle portion of the anterior crucial ligament is poor, and frequently degeneration occurs which makes plastic substitution necessary. The possibility of healing in these tears is better than one might anticipate. The blood supply must be insured by combining the plastic material with the synovia.

According to SCHLAFF, this operative exposure was introduced by himself in 1935 (*Arch. f. klin. Chir.*, 183: p. 657), when a series of 65 knee joints were explored. He advises that the strictly capsular cases should be brought to operation; the earlier they are treated the more favorable the results will be. The cases should be separated into two groups: those in which the process has extended over the cartilage and those in which it covers the bone. The operation does not produce the best results in those cases in which the joint surfaces are dried up. As in peritoneal tuberculosis, operation is useful only in the exudative phase. The real value of exposure by means of operation is diagnostic certainty and, therefore, the institution of proper treatment. The exposure reveals as much inflammation as in tuberculosis. In one case in which another clinic had designated the condition as unquestionable tuberculosis, operation did not confirm the diagnosis. Some joints show little clinical evidence under anesthesia and when operation is performed a widespread miliary tuberculosis is found. The exploration never injures but insures a clear diagnosis without limitation of function. Schlaff demonstrated 3 cases which for nine years gave evidence of satisfactory healing, complete preservation of function, and solidity of the operative joints. No joint infections were observed in the 67 cases operated upon.

LAUBER states that in the experience of the Marburg Clinic in the conservative treatment of empyema of the knee joint, the best results are obtained by means of irrigation with rivanol when the suppuration is limited to the anterior portion of the joint. If, upon the other hand, the posterior portion is involved, then one or two incisions must be made according to the method of Kroh.

ERB emphasizes the necessity of recognizing muscle atrophy and of considering the question of life insurance. When there is atrophy a less satisfactory operative result may be obtained. The lateral S-incision of Payr does away with the possibility of sensory disturbances. It is very useful for almost all interventions on the knee when there has been drainage from the capsule. However, this operation is also useful when there have not been any preceding discharges. Emergency operation may be performed through the small medial incision of Kirschner. The latest muscle-splitting incision of Panthel and the short nerve-sparing incision can be done only when the exact location of the operative site is known, which is not often the case. It is only in certain cases that injury can be avoided to the musculature. Extirpation of the free bodies in osteochondritis is not all that is necessary. The defect from which the joint mice had their origin must fill in and be smoothed. In patellar chondropathia it must be decided by probing, whether or not bony resection should be carried out. The softening of the bones goes beyond the torn degenerating part. Narcosis is not necessary for the loosening of the meniscus perre as it relaxes spontaneously under anesthesia because of loss of conduction of the sciatic and femoral nerves (Madlener and Schoenbauer).

(P. ROSTOCK). RICHARD J. BENNETT, JR., M.D.

Vandendorp, Bastien, and Vandecasteele: Late Results of Meniscectomy (Résultats éloignés des méniscectomies). *Rev. d'orthop.*, 1939–1940, 26: 629.

Vandendorp, Bastien, and Vandecasteele report 61 cases in which meniscectomy was done; in 58 cases the lesion was traumatic, and in 3 cases a cyst was found. One of the cysts was associated with trauma to the internal meniscus. In most cases the trauma was due to an industrial accident, in some cases to athletics, chiefly football. The internal meniscus was more frequently injured than the external. The two sides were about equally affected.

The chief symptoms of a lesion of the meniscus is blocking of the joint; yet this occurred in not more than two-thirds of the series. It is often not present when the rupture of the meniscus is incomplete. Other symptoms, such as hydrarthrosis of the knee and muscular atrophy, were present with varying frequency. As a rule, meniscectomy is not indicated immediately after an injury; not until at least six weeks after the injury. At that time either blocking of the joint or the presence of a painful point at the site of the injury is an indication for operation, whether other symptoms are present or not. In 2 of the authors' cases operation was done the day after the injury because of irreducible blocking of the joint. This is the only condition that justifies an early operation.

Two types of arthrotomy were used in the 58 traumatic cases, longitudinal arthrotomy in the region of the patella in 44 cases, and transverse arthrotomy with section of the lateral ligament (Tavernier's method) in 14 cases. The various types of meniscal lesions found in these cases included complete longitudinal and horizontal rupture of the meniscus, incomplete longitudinal and horizontal rupture, and avulsion of the anterior or posterior cornu of the meniscus. Longitudinal rupture was more frequent than the horizontal type. The meniscus is not necessarily completely removed; removal of the injured portion is sufficient to restore the function of the joint. The anterior cornu is detached and the removal of the meniscus carried out from the front as far back as necessary.

After operation the extremity is placed in a grooved splint; no plaster cast is used. With the vertical arthrotomy, active and passive movement of the joint is begun by the eighth day combined with massage of the muscles of the thigh and leg; walking is permitted by the twelfth day. With the Tavernier arthrotomy no movement of the joint is permitted for fifteen days, then active and passive movements are begun. Walking is permitted by the twentieth day.

Not all of the patients in this series could be traced; 2 were known to have died; 49 were reëxamined, and roentgenograms were made in 44 of these cases. The examination showed the movements of the knee joint in flexion and extension to be normal and painless in the majority of cases; in 2 cases there was a slight limitation of flexion; in 5 cases forced flexion was impossible; in 1 case extension was painful. Abnormal motility of the joint was noted in only 1 case, with slight lateral movement. Kneeling was painful in 21 cases, but in most of these cases the pain was not severe. In 17 cases the patients complained of pain in the knee, varying with changes in the weather. Muscular atrophy had entirely disappeared in those operated upon more than a year previously; it still persisted to some extent in those operated upon in 1938, i.e., six to twelve months before the follow-up examination.

In general, the results are summarized as follows:

There was complete *restitutio ad integrum* in 11 cases, 22.5 per cent. There was complete return of function of the joint with only slight pain, usually of the type associated with changes in the weather, in 21 cases, 42.5 per cent. In 12 cases, 24.5 per cent, the function of the joint was equally good, but there was more pain, especially associated with kneeling or crouching. In 5 cases, 10.5 per cent, there was definite limitation of the joint. The results with the two types of arthrotomy were about the same.

Roentgenographically, 15 of the 44 patients examined showed signs of chronic arthritis, viz., thickening or irregularities of the joint surfaces, yet these signs showed no definite relation to the clinical results. In the 4 cases in which these signs were the most marked, the functional result was excellent and pain was slight or absent. In 1 case there was osteoporosis of the external condyle of the femur, in 4 cases an intracapsular osteocartilaginous nodule, and in 1 case osteochondritis dissecans with a small fragment in process of detachment. The removal of the meniscus results in the direct contact of the condyle of the femur with the tibial plateau; roentgenographically this is shown by a shrinkage of the joint, but it is not always evident, especially in cases in which a partial meniscectomy was done. There may be some slight deformity of the femoral condyle or tibial plateau, which may tend to unite in the same way as the vertebral surfaces in scoliosis. These roentgenographic changes are due to static modifications in the joint following meniscectomy; they are often not in any relation to the clinical and functional results, which are satisfactory in the majority of cases.

ALICE M. MEYERS.

FRACTURES AND DISLOCATIONS

Roska, L.: The Complications of Supracondylar Fracture of the Humerus (Ueber die Komplikationen der suprakondylaeren Oberarmbrueche). *Orvosképzés*, 1939, 29: 468.

Ten of the fractures encountered by the author from 1930 to 1939 were supracondylar fractures in adults. The supracondylar-intercondylar (T- and Y-shaped) fractures which occur especially in the aged are included in this group. The important factor, aside from trauma to the skin and muscles, is injury to the nerves and blood vessels, particularly the radial nerve, with resultant ischemic contracture and gangrene.

The most frequent complication is injury of the radial nerve. The hand hangs in flaccid volar flexion at the wrist and extension of the proximal phalanges of the fingers and supination of the extended forearm are impossible. Simple contusion of the nerve often recedes quickly. If perfect reposition is accomplished early the symptoms produced by overstretching of the nerve are quickly eliminated. However, if the nerve is destroyed the paralysis continues or becomes more marked and often persists for many months or even years after operation. Delayed paralysis may be produced by pressure at the site of callus formation, by scar tissue, by poor reduction, or by pressure from the dressings, particularly if circular plaster casts are used, and may produce degeneration of the nerve.

The mechanism of injury of the median nerve is similar to that of the radial nerve, but because of its anatomical position, lying beneath a thick pad of muscle, this nerve is less often injured. Compression of the blood vessels with disturbance of the circulation is a frequent, associated condition. The vascular phenomena govern the clinical picture. True injury of the median nerve produces inability of pronation and flexion of the hand and disturbances of sensation on the volar side of the hand, in the wrist, and in the fingers. If good reduction is obtained improvement in the vascular symptoms can be noted after from twenty-four to forty-eight hours.

The ulnar nerve is seldom injured. It may be injured by fractures of the flexion type, which is readily explained by the fact that the distal fragment of bone presses into the sulcus of the ulnar nerve and compresses the nerve. The typical picture of paralysis of the ulnar nerve is the claw position of the hand which is produced by overaction of the extensor muscles.

Serious complications result when blood vessels are injured. The brachial artery or the cubital artery may be damaged by the proximal fragment of the bone. Additional complications are the formation of cubitus varus and valgus and, finally, of traumatic myositis ossificans of the brachialis muscle, a rare complication of supracondylar fracture which is found much more frequently with luxation of the elbow. (E. Illés). EDWARD W. GIBBS, M.D.

Mayer, J. H.: Colles's Fracture. *Brit. J. Surg.*, 1940, 27: 629.

It is an unfortunate fact that Colles's fracture has come to be regarded as an injury easy to treat and one that may be expected to give almost uniformly good results. This point of view exists in the presence of from 15 to 20 per cent of imperfect or frankly poor results.

It is true that function may be perfect in the presence of slight persistent displacement, but perfect anatomical restoration is essential to consistently good functional results. In the author's review the final anatomical result was satisfactory in less than half of all cases with displacement, and a careful analysis of the serial roentgenographs in the unsatisfactory cases indicated that the failures were due to inadequate splintage after reduction.

There is an additional element in the original displacement to those ordinarily described that is frequently responsible for inadequate reductions and recurrences of deformities when insufficient splintage is employed. There is a rotation of the distal radial fragment on its long axis, in the direction of supination. This supination twist carries the lower radial fragment around and sometimes away from the head of the ulna, and away from the pronated upper radial fragment. The supination twist is almost a constant part of the deformity in a true Colles's fracture and to obtain a satisfactory anatomical reduction it is essential to pronate the lower fragment during reduction. A powerful twist of the lower fragment into pronation is absolutely essential in these cases. A combined manipulation of traction, forward angulation, ulnar deviation, and pronation twist gives improved results and the ulnar styloid resumes its normal position in those cases in which it was displaced. General or local anesthesia may be used, but muscular relaxation must be complete.

Immediately after reduction a skin-tight plaster cast is applied; it should extend from the metacarpal necks to the middle of the humerus, with the forearm and hand fully pronated, the wrist ulnar-deviated and slightly palmarflexed, and the elbow flexed to a right angle. Particular care is taken in molding around the lower end of the radius. The plaster is not bivalved or otherwise disturbed. Circulatory disturbances are avoided by instituting active finger and thumb exercises immediately. This type of cast controls the pronation-supination movements of the forearm, and splintage must be maintained in full pronation to prevent redisplacement. The cast is left on for three weeks. A second cast is applied at the end of three weeks. It extends to the elbow and holds the wrist in a straight position. The second cast is worn for two weeks while consolidation occurs.

The author's results following Colles's fracture have been greatly improved since he employs the above principles of analysis, manipulation, and immobilization. The one exception to the above treatment in a Colles's fracture is an accompanying fracture of the neck of the ulna. This condition is best treated with a long arm cast with the forearm in midprone position.

The roentgenological appearance of a supination twist is characteristic. The lower fragment appears in the anteroposterior view to overlap the upper fragment on both sides and to be considerably broadened, and in the lateral view there is an apparent backward displacement.

The author discusses in detail a large experimental series of cases, the mechanism of Colles's fracture, the inferior radio-ulnar joint and the important part the fibrocartilage of this joint plays in the occurrence of, and reduction of, a Colles's fracture, and the anatomical, functional, and cosmetic results and complications. Numerous roentgenograms, summary charts, and an explanatory diagram are presented. ROBERT P. MONTGOMERY, M.D.

Buerkle-de la Camp, H.: The Functional Treatment of Vertebral Fractures as Compared with the Boehler Method of Vertebral Fracture Reduction (Funktionelle Wirbelbruchbehandlung oder Boehlersche Wirbelbruchaufrichtung). *64 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1940.

From the first of January, 1934, to the first of March, 1940, there were a total of 1,090 recent spinal column injuries in the Bergmannsheil Hospital in Bochum, and among these 631 fractures of the vertebral body were treated. The author, on the basis of this material, has undertaken to carefully compare the results of two forms of treatment. Since Haumann and Magnus have previously reported in detail concerning the functional method of treatment of vertebral fractures, as the latter has been practiced for decades by Loebker and von Bsnnn at the Bergmann Institute, the author primarily discusses the results of the reduction method of treatment. In his introduction he first establishes the fact that he has carried out the reduction method of treating vertebral fractures exactly according to the directions of Boehler, and he has similarly been guided by Boehler's directions in the application of the plaster jacket and in the carrying out of the subsequent exercises. On the other hand,

he questions the conception implied by the term "functional treatment of vertebral fractures." Under this terminology, the author includes not only the immediate usual flat position upon a thin mattress placed upon boards for a period of from five to seven weeks, in the third week of which the prone position and treatment of the dorsal musculature with heat and massage is started, but he particularly includes the rehabilitation treatment with gymnastics and athletic exercises. After taking into consideration this limitation of the functional method of treatment, he declares himself against calling this treatment "vertebral fracture treatment with massage." Moving pictures which were shown when the author read his paper were very enlightening, especially concerning the rehabilitation treatment.

As the roentgenograms showed, it may be accepted as certain that it is possible to successfully reduce vertebral fractures and to reduce dislocations. Attention is called, however, to the studies of Lob and Straube which show that reduction is not always uniform, because frequently fragments of the cortical plates cannot be included, which is true especially if the ligamentous connections between the vertebral bodies are injured. In those cases, also, in which there is injury to the intervertebral discs, an incomplete reduction usually results, because prolapsed fragments of the intervertebral discs remain behind and these structures therefore become incapable of bearing the weight of the vertebral bodies. Attention is called particularly to the difficulties which are generally met in the attempt to reduce fractures of spongy bones which have become impacted. Even the immobilization for a period of months, in a plaster jacket, is unable to influence such circumstances. The author did not carry out the treatment with the plaster jacket for periods as long as eleven months, as has been suggested by Boehler in many cases, but he pursued this form of treatment for periods as long as seven months in cases of severe fractures. It has come to his attention that in the cases observed by him (altogether 93 vertebral fractures were reduced), there was a considerable loss of elasticity associated with a pronounced stiffness of the spinal column following the removal of the plaster jacket; these conditions are attributed to the prolonged immobilization of the vertebral articulations in hyperextension. In this respect, attention should be called to the fact that with few exceptions the patients treated by the author consisted chiefly of hard manual workers (miners), in whom the so-called "work hump" appears much earlier than in those engaged in other occupations; furthermore, this class of workers rarely engage in acrobatic maneuvers even in their daily lives.

Among the 631 vertebral fractures observed, 54 of the victims had spinal-cord injuries at the time of their admission to the hospital. Of the latter group 27 had reductions without showing any improvement in the transverse paralysis following the reduction. No case was observed which showed an abrupt recovery immediately after reduction. On the other hand, in 1 of the cases immediately following the reduction, a marked aggravation of the previously mild paralytic phenomena was observed; in 5 others of the injured, paralyses first became evident after the reduction! Of these 6 cases, 3 terminated fatally. In this connection, attention was directed to the case of Straube in which there was a separation of an upper posterior triangular fragment which became wedged even more firmly in the vertebral canal during the reduction; the author was able to personally observe a similar condition in 1 of the cases in which he had undertaken operative intervention.

The following figures are given for comparison of the two different modes of treatment:

	Functional treatment	Reduction treatment
Length of illness in days.....	113.9	211.6
Number of days in hospital.....	45.5	22.2
First disability compensation.....	33.7	42.4
Permanent disability compensation	16.3	30.3

In this table are presented only those cases in which there was no nerve injury. Especially to be noted is the decided prolongation of the number of days of illness as well as the markedly higher level of compensation rates in the cases treated following reduction. The remarkable difference in these figures, as compared with the statistics of Boehler, should, according to the opinion of the author, be attributed to the basic difference in the manner of determining compensation as practiced in the Ostmark and as practiced in the Altreich. As the experiences of the author have shown, the psychic attitude of the injured person plays an important rôle in the reduction method of treatment of vertebral fractures; the patients with fractured vertebræ who are treated by reduction "resign themselves to wearing the plaster jacket longer so that they may preserve their peace of mind further." This false mental attitude is attributed to the fact that the injured person has the feeling that he seriously injured himself simply because he has been given so much attention.

On the basis of his extensive experiences, the author is of the opinion that the functional method of treatment of vertebral fractures is still, just as formerly, to be regarded as the method of choice, and that the danger of the formation of a kyphosis, so greatly feared by Boehler, should not be regarded as the determining factor in the indication for reduction. He believes that the degree of paralysis present is of prime importance in this respect. In his conclusion, he calls attention to the fact that the injured physician, presented by Boehler, was suffering from a type of fracture which in reality did not even require reduction, and for that reason this case is not necessarily an argument in favor of the reduction method of treatment. In addition, "companies of functionally treated miners" demonstrate the correctness of the functional method of treatment.

(Andreesen). Harry A. Salzmann, M.D.

Corrêa do Lago, Jr.: Posterior Marginal Fracture of the Upper Plane of the Tibia (Fractura marginal posterior do planalto tibial). *Rev. brasil. de orthop. e traumatol.*, 1940, 1: 375.

Corrêa do Lago discusses a case of isolated fracture of the central portion of the posterior border of the upper tibial plateau. To his knowledge, this type of fracture has not been reported up till now. He discovered this fracture in a woman, aged twenty-seven years, who while riding a bicycle struck her left knee lightly against a truck. She experienced only slight pain and continued her journey. When examined two days later, the only anomalies found were an effusion in the joint and moderate pain on digital pressure in the popliteal space over the posterior upper part of the tibia; passive movements were practically painless and there was little interference with walking. Roentgen examination revealed a line of fracture running from the surface of the upper tibia plateau, close to the posterior border, obliquely down and backward and detaching clearly a small fragment from the median part of the posterior border of the bone. The line of fracture was just visible in its upper part and fused with the posterior aspect of the bone in its lower part. A plaster splint was applied from the root of the thigh to the toes, and was left on for two weeks. After removal of the splint, mixed mechanotherapy was given for one week because of rather marked atrophy of the extremity, and the patient was discharged as cured six days later.

The author has no doubt that in this case the fracture occurred by divulsion exactly at the point of insertion of the posterior cruciate ligament: the knee being flexed and the tibia fixed on the pedal of the bicycle, the blow on the anterior part of the knee caused a sudden backward displacement of the femur, and the posterior cruciate ligament resisting the movement, had torn off the portion of the border of the tibial upper plane into which it is solidly inserted. The spines of the upper tibial plateau remained intact as proved by the absence of hemarthrosis, and the point at which the fracture occurred was undoubtedly extrasynovial.

It is interesting to note that, from the beginning, the various authors who have discussed the subject have called attention to the fact that the line of fracture follows exactly the direction of the bone trabeculæ which reinforce the epiphysis. In lateral projection, the trabeculæ reinforcing the upper epiphysis of the tibia form two arches which intersect one another from the front toward the back and *vice versa*. In the present case, the line of fracture cuts diagonally through the trabeculæ of both arches.

Another interesting point is the absence of the articular symptoms that might have been expected from the fracture: this was probably caused by the retention of the correct position of the fragment in its lower part, which was the result of the fibrous expansions of the cruciate ligament.

RICHARD KEMEL, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Zsedényi, G.: Anesthesia of the Femoral Nerve in Operations for Varicose Veins (Ueber die Betaeubung des N. femoralis bei Varix-Operationen). *Orvosképzés*, 1939, 29: 195.

There is no valuable reference in the literature to the anatomical relations of the field of operation for varicose veins and the sensory distribution of a very easily accessible nerve trunk. In most cases varicose-vein operations are limited to a resection of the trunk of the great saphenous vein and its accessory branches. The dilated branches of the small saphenous vein are seldom resected, and even more rarely the veins of the lateral surface of the thigh and leg. Consequently, if we consider interruption of the great saphenous vein as the common type of operation, the following considerations are of certain value:

General anesthesia is unnecessary for incision of the skin and ligation of a superficial vein. Spinal anesthesia eliminates the great advantage of conduction anesthesia with regard to complications and sequelæ. Anesthesia of 6 nerve trunks, 12 if done on both sides, means a search for 12 nerve roots; a lengthy, detailed procedure. On the other hand, anesthesia of the femoral nerve may be accomplished by a single maneuver and is a technically simple procedure which is reliable and produces superficial anesthesia in the exact area of incision for a varicose-vein operation. Then it is only necessary to anesthetize the area around the fossa ovalis by subcutaneous infiltration.

The author obtained transient anesthesia of some degree with the Laeven technique in more than 100 cases and concluded that it is invariably necessary to search directly for the nerve with the needle. The deposition of novocaine specified by Laeven reaches to a certain part of the musculature but is without effect. On the other hand, if the needle is made to touch the nerve, as evidenced by the resultant paresthesia, only a few cubic centimeters of the solution are necessary to obtain complete anesthesia.

The author's technique for more extensive anesthesia is modified from his experience, in the following manner:

The femoral pulse is palpated with the second and third fingers of the left hand in such a manner that the upper finger comes in contact with the inguinal ligament. The needle puncture is made one-half cm. lateral to the nail of the lower finger. A wheal is not necessary. If the fingers are pressed deeply and firmly one can infiltrate between the nerve and the artery while protecting the latter from a needle puncture. If the nerve is not found on the first attempt, the needle should be withdrawn and again introduced about 3 cm. lateral to this point and perpendicular to the artery. If the nerve is still not located it will then invariably be found in the midline between these two points. All variations of the nerve fall in this fork. It is important to hold the needle in a vertical position.

In the course of this procedure the femoral nerve is anesthetized first with from 4 to 5 c.cm. of 2 per cent adrenalin solution, the anesthetist standing on the opposite side of the extremity to be operated upon. Anesthesia is complete in about ten minutes. During this time the area around the fossa ovalis is anesthetized by infiltration with a 1 per cent solution. Before the operation, the anesthesia of the operative field should be tested by needle pricks.

It is characteristic of the reliability of this type of anesthesia that the entire area between the borders of the anesthesia can be operated upon. There are no unanesthetized islands. The anesthesia extends distally to the internal malleolus and lasts from three to four hours. Troublesome complications and sequelæ have not been observed.

In summarizing, conduction anesthesia of the femoral nerve is technically simple and reliable in its effect. The area of anesthesia corresponds in size and shape to the vascular network of the saphenous vein. (E. Illés). Edward W. Gibbs, M.D.

BLOOD; TRANSFUSION

Pian, H. C., and Frazier, C. N.: Lesions of an Erythema Multiforme Type. *Chinese M. J.*, 1940, 57: 301.

The authors note that in all of the cases of transfusion syphilis reported in the literature up to 1938 the donors had not been given either a serological test for syphilis or a physical examination. Syphilis can be transmitted from the blood of donors who are in the prechancre period of the disease. Under this circumstance, there is neither physical nor serological evidence of infection, and, thus, no way to detect the presence of the disease at the time that the transfusion is given.

Two cases of transfusion syphilis are reported, in both of which the infection was contracted from the blood of a donor who was in the primary incubation period of the disease. At the time of both donations there was neither physical nor serological evidence of syphilis in the donor.

The occurrence of widespread lesions of the skeletal system in both recipients was noteworthy. In one recipient the lesions took the form of an acute destructive osteomyelitis with multiple foci in the long bones of the extremities and the flat bones of the skull. The second recipient developed multiple periosteal lesions and a papular cutaneous eruption like that of erythema multiforme. The influence of the size of the inoculum and the route of infection on the virulence of the disease is discussed.

In discussing the procedure for the prevention of infection of this nature, the authors conclude that the only protection against unfortunate accidents such as this is constant vigilance and the critical application of the common methods of physical and laboratory diagnosis. In instances where these fail to detect the presence of infection, as in the 2 cases reported, the disease transmitted to the recipient will have to be dealt with directly, as the circumstances may require. Fortunately, such cases are extremely rare. HERBERT F. THURSTON, M.D.

Wiener, A. S., and Peters, H. R.: Hemolytic Reactions Following Transfusions of Blood of the Homologous Group, with 2 Cases in Which the Same Agglutinogen Was Responsible. *Ann. Int. Med.*, 1940, 13: 2306.

The authors note that hemolytic reactions have recently been encountered following transfusions in which the patient and donor belonged to the same blood group. Evidently such cases are rare, since only about a dozen definitely established instances have been reported in the literature to date. The hemolytic transfusion reactions belonging to this last category, namely, those due to "intragroup" incompatibility, are the subject of this report. Three cases are reported in which repeated transfusions of blood of the proper group gave rise to hemolytic reactions; the reactions resulted in the death of 2 patients.

In 2 cases there was noted the appearance in the patient's serum of an iso-agglutinin designated as anti-Rh. This is explained as the immune response to the injection of Rh+ blood into Rh− individuals, the blood group playing no rôle. Following the appearance of the anti-Rh agglutinins the transfusion of Rh+ blood gave rise to hemolytic reactions. Remarkably, the reactions of the anti-Rh sera corresponded with those of immune rabbit sera prepared by Landsteiner and Wiener, by the injection of rhesus blood. The frequency distribution of agglutinogen Rh in the general population is approximately 85 per cent Rh+ and fifteen per cent Rh−.

Methods are suggested for the prevention of the occurrence of intragroup hemolytic reactions. The danger of intragroup hemolytic reactions has been shown to be greatest in patients receiving repeated blood transfusions and in post-partum cases. With regard to the warning not to use the same donor for patients receiving repeated transfusions, our findings show that this measure is not sufficient to exclude transfusion reactions, since the antigens responsible may occur in a considerable percentage of individuals. A technique of cross-matching is advised, to be used in addition to the usual grouping and cross-matching tests, as it will anticipate most reactions of the intragroup type. Moreover, in patients receiving repeated transfusions and in post-partum cases, the serological test should be supplemented by a biological test, if time permits. In citrate transfusions it is a simple matter to inject the first 50 or 100 c.cm. of blood very slowly in order to determine whether a reaction will occur. If a chill results, the infusion should be stopped and another donor tried. This procedure would probably prevent any serious consequences since 100 c.cm. of incompatible blood are hardly enough to cause a fatal reaction. In a series of 15 hemolytic reactions with 10 fatalities analyzed by Bordley, all patients receiving less than 350 c.cm. of blood recovered.

HERBERT F. THURSTON, M.D.

Sassi, R.: The Utilization of Placental Blood for Transfusion (Sulla utilizzazione del sangue placentare a scopo transfusionale). *Ginecologia*, Torino, 1940, 6: 205.

The placental blood is collected in a flask under sterile precautions by means of the insertion of a needle or sharpened pipette into the umbilical cord. It is mixed with a sodium-citrate solution or one of the commercial anti-coagulants and refrigerated until used. Daily bacteriological studies are made and blood more than ten days old is not used. From 50 to 200 c.cm. are obtained from one placenta.

The author believes that such placental blood has special erythropoietic actions and a hormonal and immunological content superior to that of adult blood. He has given 74 transfusions to 21 patients, 6 of whom had primary dyscrasias and 15 secondary anemias. Repeated small transfusions were used and he believes that there was a definite hematopoietic response in 16 patients. Some reactions were observed, but none were particularly severe.

FRANK MCDOWELL, M.D.

Stewart, C. P.: Studies on Stored Blood. Results in a Series of 427 Transfusions. *Edinburgh M. J.*, 1940, 47: 441.

The author stresses the fact that transfusion with stored blood is still sufficiently novel to justify publication of the results obtained in a series of such transfusions. He brings out in the article the fact that a clinical trial is essential, and that it is extremely difficult to change the relative values of fresh and stored blood when, as in many cases, the results depend upon impressions. Direct comparisons are not possible.

Since September, 1939, he has received reports of 427 transfusions with blood which has been stored for periods ranging from an hour or two to as long as three days. A series of charts giving the length of storage time and the type and total of reactions is shown, and the following conclusions are made:

Storage of blood for not more than fourteen days does not increase the reaction incidence, and there is some evidence that with blood stored for from five to ten days the incidence may be reduced. On the whole it is safer to regard fourteen days as the limit of storage although evidence from a recent series of transfusions suggests that in an emergency it would be justifiable to use older blood for cases of severe acute hemorrhage.

In a series of 427 transfusions with blood up to thirty days in storage, there were 58 reactions of all kinds (13.6 per cent), and of these from 8 to 2 per

cent were classed as medium or severe. In 259 of these transfusions, done since January 1, 1940, there were 27 reactions (10.4 per cent) of which 6.2 per cent were medium or severe. In the whole series, blood not more than fourteen days old (299 cases) gave a total reaction incidence of 12.3 per cent, and a medium or severe reaction incidence of 7.3 per cent.

Blood which has been stored should not be used indiscriminately. Certain cases should receive blood not more than two days old, since by that time a considerable proportion of the viable leucocytes has disappeared. In these cases, in which the object of transfusion is to increase the defense mechanism, the necessity for providing leucocytes outweighs the lessened reaction incidence obtainable with blood stored for from five to ten days. Older blood seems to be suitable when the object of the transfusion is to supply fluid and oxygen-carrying power. Reliable estimates of the therapeutic value of stored blood are, however, difficult to obtain.

It seems possible to obtain the advantages of a blood store with good therapeutic effects in all types of cases, only if blood is withdrawn so frequently that almost fresh blood is always available. Many of the cases requiring fresh blood are not emergencies, and for them transfusions can usually be arranged on the day when blood is being withdrawn for the store. In this way practically "direct" transfusions can be given while use is being made of the services of the trained personnel of the store, and the inconvenience to donors is minimized. PAUL MERRELL, M.D.

DeGowin, E. L., and Hardin, R. C.: Reactions from Transfusion of Preserved Blood. Experience with 1,600 Transfusions. *Brit. M. J.*, 1940, 2: 1.

Data have been presented on the incidence and types of reaction occurring in a series of 1,458 transfusions of blood stored from one to thirty-eight days, and 146 transfusions of fresh blood. No types of reaction were encountered that were distinctive of preserved blood. The incidence of various types of reaction did not increase or decrease with the period of storage of the blood mixtures. A limit of ten days of storage at 3 to 5° C. was found to be safe for citrated blood. Blood stored in the dextrose-citrate mixture described was found to be safe for transfusion after thirty days of storage.

A comparison of the incidence of pyrogenic reactions in a series of 951 blood transfusions with that in a series of 7,181 parenteral injections of saline or dextrose showed that about 3 per cent of the febrile reactions from the blood transfusions could not be attributed to pyrogens in the apparatus or fluids used. This comparison did not exclude the possibility of the introduction of pyrogenic organisms at the time of the collection of the blood. The presence of pyrogens should be suspected when the incidence of febrile reactions is high.

The occurrence of fever which persists for three or four hours and usually is preceded by a chill is the most common type of reaction from blood transfusion. By alteration of the technique in the preparation of materials, the incidence of pyrogenic reactions fell to 0.2 per cent. The incidence of chills and fever in blood transfusions, however, has continued to be about 3 per cent. This could be due to: (1) some peculiarity in the blood itself; (2) the introduction at the time of collection of the blood of organisms which live for a few hours, produce pyrogens, and are then killed by the normal bactericidal agents in the blood; and (3) the contamination of the sodium citrate with pyrogens. The first two possibilities seem the more likely.

There were 2 deaths from transfusions, 1 from incompatible blood and 1 from cardiac embarrassment. Neither of these could be attributed to the use of preserved blood in contradistinction to fresh blood. HERBERT F. THURSTON, M.D.

Bécart, A., and Philippe, B.: Preserved Plasma Containing Sulfanilamide. Its Advantages in Emergency Transfusion in the Absence of a Donor (Le plasma humain sulfamidé. Ses avantages dans la transfusion d'urgence en l'absence d'un donneur de sang frais). *Presse méd.*, Par., 1940, 48: 535.

The authors emphasize the therapeutic importance of emergency transfusion in traumatic shock and hemorrhage. Whereas in such conditions fresh blood from a readily available donor is desirable, in war practice this is not possible because of the difficulty of maintaining a sufficient number of catalogued donors. For this reason it is necessary to substitute some other method, such as the use of preserved blood.

Certain features of preserved blood are described. Morphological changes in the red blood cells begin often within seven hours and in from twenty-four to forty-eight hours the erythrocytes appear crenated, slightly vacuolated, unequally colored, and irregular in contour. There is also some fragmentation as well as microscopic agglutination and diffusion of hemoglobin. Lysis of the polymorphonuclear leucocytes occurs rapidly and their number diminishes 50 per cent in the first forty-eight hours. The complement and bactericidal power of the serum remain well preserved, whereas the phagocytic activity disappears in seventy-two hours. The oxygen-carrying capacity diminishes slightly, but the lactic acid and phosphorus levels increase. There is a rapid and marked diffusion of potassium. The authors reëmphasize that these alterations in preserved blood make its use undesirable after two or three days. On the other hand, preserved plasma is free from these alterations and yet serves the same purpose in the treatment of shock.

The authors briefly describe the method of preparation of plasma. The blood is citrated to 0.4 per cent and at the end of seven hours the supernatant plasma is poured off. It is further purified by a second decantation at the end of twelve hours, following which time it is placed in ampoules. The remaining sediment is slowly centrifuged for one

hour and its plasma content also obtained. The authors direct attention to the fact that this plasma contains a high content of platelets and that this may be of hematopoietic significance to the donor. In addition to being free from the disadvantages of preserved whole blood, preserved plasma has the advantage of not requiring grouping. Moreover, refrigeration is unnecessary and the plasma may be kept for long periods.

The authors then briefly review the use of sulfanilamide in preserved plasma and its advantages in increasing the bactericidal power and nullifying the possibility of contamination. The sulfanilamide content should be from 0.3 to 0.4 per cent.

MICHAEL DEBAKEY, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Nordin, G.: Schaumann's Disease (Benign Lymphogranulomatosis) with Plaques of Erythroderma and Iridocyclitis as the Dominant Clinical Symptoms (Maladie de Schaumann (lymphogranulomatose bénigne) avec plaques érythrodermiques et iridocyclite comme symptômes cliniques dominants). *Acta med. Scand.*, 1940, 104: 131.

Nordin reports a case of Schaumann's disease, or benign lymphogranulomatosis. This disease may cause few clinical symptoms, although the lesions are widespread throughout the organism in the deeper organs and tissues. In the case reported, the patient was a woman twenty-six years of age; four months after the birth of her child she showed signs of nephritis; albumin had been present in the urine in the latter part of pregnancy, but had disappeared after delivery. The nephritis was soon relieved under hospital treatment. Roentgenological examination of the lungs, because of some expectoration, showed numerous dark areas, connected by radiating shadows. Tubercle bacilli were never found in the sputum, and the tuberculin test was negative. Later expectoration ceased, and the lungs cleared somewhat, but several of the dark spots remained. Subsequently the patient developed iridocyclitis, first in the right, then in the left eye. Still later the cutaneous lesions developed on the legs, especially on the anterior surface. They consisted of clearly outlined red spots with little or no infiltration and very slight desquamation; they caused no discomfort. They eventually disappeared almost completely. Roentgenological study of the bones of the hands and feet showed nothing abnormal.

Histological examination of one of the cutaneous lesions showed that it conformed exactly to the description given by Schaumann of the lesions of benign lymphogranulomatosis. The characteristic epithelioid cell groups did not form large masses, but were small, collecting around the hair follicles and the sweat and sebaceous glands. Only relatively few cases with such cutaneous lesions have been described, and some of these have not been recognized as being typical of Schaumann's disease; they are sometimes described as "lupoid" or "sarcoid." The pulmonary lesions in this case are the same as those described by Schaumann. The iridocyclitis in this case was characterized by increase in the intraocular pressure and the development of minute lupoid nodules especially on the border of the iris, associated with a tendency toward synechiæ and punctate keratitis. Similar lesions have been described in other cases of Schaumann's disease.

ALICE M. MEYERS.

Sugarbaker, E. D., and Craver, L. F.: Lymphosarcoma: A Study of 196 Cases with Biopsy. *J. Am. M. Ass.*, 1940, 115: 17.

Lymphosarcoma is a malignant neoplastic disease of lymphoid tissue capable of arising in any lymphoid aggregate. It may run an acute or chronic course and is almost invariably very radiosensitive. An apparent cure is possible, but the disease is much more likely to terminate in death, at which time the wide extent of clinically unsuspected metastases may be astonishing. The term "lymphoblastoma" has gained considerable popularity as a means of rather loosely conjoining a number of conditions of which lymphosarcoma and Hodgkin's disease make up the majority. By implying a common genesis of the two diseases, for which there is no justified foundation, the term has brought about a merging of the two conditions, in which the distinctive features of each have been lost.

The authors present a study of lymphosarcoma, based on a series of 196 cases, in each of which the diagnosis was confirmed by biopsy.

The frequency with which chronic infections are noted, particularly long-standing inflammatory processes in the upper respiratory system, in patients whose first evidence of lymphosarcoma appears as a nodal swelling in the neck, is rather striking. Actually 32 per cent of the patients whose first symptom of lymphosarcoma was cervical adenopathy complained of some definite chronic infection of the upper respiratory tract. The rôle of tuberculosis, however, is much less evident in lymphosarcoma than it is in Hodgkin's disease. It is not inconceivable that prolonged stimulation of the lymph nodes may eventuate in malignant cellular activity.

Males are more frequently affected than females in the ratio of about 7:3 (1.4:1 in Hodgkin's disease). The average ages of the two sexes at the time of admission to the hospital were approximately the same, 45 and 45.3 years, respectively, about ten years higher than in Hodgkin's disease and somewhat lower than for the commoner types of cancer. In general, lymphosarcoma is rare before the age of twenty years and after the age of seventy years. The youngest patient was four years old and the oldest eighty-eight, and one of the authors has seen a proved case in a woman aged one hundred and seven.

Visible and palpable external glandular swelling constituted the first evidence of disease in 65 per cent of the patients. The enlargement was in almost

all cases entirely painless. Symptoms referable to the abdomen occurred in 17.5 per cent of the cases, and in two-thirds of these the main complaint was pain of varying degree, usually little more than a vague discomfort, but occasionally it was sharp and colicky; it was due presumably to interference with bowel function. Partial or complete intestinal obstruction, indefinite gastric complaints, melena, ascites, and a dragging sensation in the abdomen make up the remainder of the symptoms. In 11.6 per cent of the cases difficulties of the upper respiratory tract were complained of first. Thoracic symptoms were first to appear in only 3.6 per cent (pain, dyspnea, cough, and upper mediastinal syndrome). Bone pain occurred initially in 1.83 per cent. Systemic symptoms (chill, fever, lassitude, increased sweating, weight loss) are conspicuously absent in early lymphosarcoma, and they rarely appear until the disease has reached a stage which is quite far advanced.

Two-thirds of the entire series of patients never had what could reasonably be supposed to represent an extranodal primary focus. In 59 per cent of the cases the first node involvement occurred in the neck; the axilla was first involved in 11.4 per cent, the groins in 11.9 per cent, the abdominal nodes in 13.1 per cent, the mediastinum in 1.1 per cent, and the epitrochlear nodes in 0.5 per cent.

In general, lymphosarcoma is an acutely malignant disease. Chronic forms do occur but constitute a small minority. In no other disease is metastasis apt to be so sudden and widespread. Hardly an organ or tissue is spared. The spleen was palpable in 21 per cent of the cases; but, unless lymphatic leukemia became superimposed, it was rarely greatly enlarged. Liver involvement as evidenced by a palpably enlarged organ was noted in only 8 per cent. There was roentgenographic evidence of pleuropulmonary infiltration in 12 per cent of the cases as manifested by lung mottling or pleural effusion. X-ray evidence of secondary bone involvement was present in 9.1 per cent. Undoubtedly this figure is too low.

There is no specific hemogram in lymphosarcoma. In contradistinction to patients with Hodgkin's disease, in whom anemia usually develops early, patients with lymphosarcoma maintain excellent hemoglobin values for some time. As a result of advancing disease combined with radiation therapy, very definite blood-cell changes took place, as indicated by counts taken from six months to several days before death. The most important of these changes was anemia.

Experience in clinical observation of the lymphomas teaches caution in attempting differential diagnosis except by an excisional biopsy interpreted by a skilled pathologist. There are no clinical features which will permit without exception a differentiation between tuberculous lymphadenitis, Hodgkin's disease, lymphosarcoma, aleukemic lymphatic leukemia, lympho-epithelioma, or even metastatic carcinoma in lymph nodes. The application of a therapeutic test dose of radiation is of little diagnostic value, as any of the first mentioned conditions may respond as readily as does lymphosarcoma.

JOSEPH K. NARAT, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Sievers, R.: The Diagnosis and Indications in the Surgery of Children for the Practicing Physician (Zur Diagnostik und Anzeigestellung in der Chirurgie des Saeuglingsalters fuer den praktischen Arzt). *Fortschr. d. Therap.*, 1939, 15: 513.

Collaboration with the pediatrician is essential in the surgical treatment of children. The general anesthesia of choice is rectal avertin narcosis; this will be supplemented by chlorethyl or vinethen only rarely. Local anesthesia, when practicable, is given preference, e.g., in operations for angiomas, pylorospasm, congenital clefts about the face, and on the rectum and extremities. Extensive resort is made to Dogliotti's peridural anesthesia, which the author especially recommends; all operations below the arch of the ribs, even in the earliest periods of life, are carried out with this type of anesthesia. The author emphasizes the accuracy, safety, and long duration of this anesthesia, and also the absence of collapse of the blood pressure and the favorable influence on incarcerated hernia and atonic ileus.

Hernia of the umbilical cord should be operated upon in the first hours of postnatal life. In rare instances reposition of the hernia will be obtained with firm twisting of the cord and the application of an adhesive corset. The possibility of other malformations in the same patient is always to be kept in mind. Congenital closure of the esophagus ends fatally in almost 100 per cent of the cases; the constant gurgling sound of milk and mucus in the pharynx, refusal of feedings, and attacks of coughing and of suffocation are characteristic of this condition. Congenital intestinal occlusion is especially frequent in the duodenum, lower ileum, and colon; every case of intractable vomiting in an otherwise healthy child requires the attendance of a surgeon. The passage of meconium during the first few days of life should not be considered the final criterion.

Atresia ani and recti are discussed; intestinal occlusion with fistula into the vagina or vestibulum in the female, or into the bladder or urethra in the male, is recognized from the absence of the anal cavity, despite the discharge of meconium. These patients, also, sooner or later require the services of a surgeon. Congenital occlusion of the male urethra is rare; absence of urination quickly reveals this condition. It is a simple matter to rectify membranous closure of the external urethral meatus; however, it is difficult to treat the obstructions in the internal urinary tract; valve formations, stenoses, and tumors may be the causative factors, and as a rule they require surgical interference. The Tolmatschew semilunar valve provides a valvular closure which may be overcome by the catheter. According to Schiff, in 4 per cent of children the normal discharge of urine sets in only after the fourth day.

In birth injuries correction of displacements is successful only within the first five days, since these fractures heal rapidly. Most frequent are the fractures of the clavicle. Birth-fractures of the shaft of the upper arm and the upper end of the humerus demand careful treatment; only in the subperiosteal fracture is a splint and bandaging to the trunk sufficient. Luxation of the shoulder does not occur and a distortion should not be assumed in the presence of marked local symptoms. Of importance is the birth palsy of the plexus brachialis; it is recognized by the flaccid paralysis, and splinting is required in order that contractured posture is prevented. Fractures of the femur are frequently not recognized early enough.

In myelomeningocele an accompanying hydrocephalus, paralyses, deformities of the legs, and incontinence of the bladder and intestines are to be regarded as contraindications to operation. Encephalocele is frequently sooner or later operated upon successfully. Harelip is operated upon in the second month. The treatment of umbilical and inguinal hernias is surgical from the seventh month on, unless incarceration should force matters sooner. Cryptorchidism and exstrophy of the bladder come to operation later, the latter not till the fourth year, according to Coffey. Hypospadias is operated upon in infancy only in cases of stenosis or distortion of the penis. Children with pseudohermaphroditism are brought up as girls and are operated upon only at the onset of the secondary sexual characteristics. Too much operating is done for phimosis; only hindrance to the urinary stream justifies such a procedure. Hemangiomas should be operated upon as early as possible.

The position which the author takes with reference to pylorospasm, appendicitis, and invagination is explained.

Osteomyelitis is particularly frequent in the nursling and has a mortality of from 34 to 40 per cent. The non-fatal cases, upon early abscess and rupture to the outside, have a better prognosis than those of older children; the rupture of abscessed processes out of the joints also is in many instances comparatively benign and, especially in cases of the hip joint, is not recognized, until months later when complete luxation occurs. Puncture of the abscess and incision and immobilization of the part suffice. Cranial and jaw osteomyelites should have special consideration in the infant; the former must be attacked surgically at an early period in order to forestall meningitis; in the latter condition it is found to be enough to incise the abscess from the inside of the mouth.

(HUBMANN). JOHN W. BRENNAN, M.D.

Robbins, B. H.: Pre-Anesthetic Medication. *Arch. Surg.*, 1940, 40: 1044.

The use of non-volatile chemical agents, such as morphine or other opium derivations, barbiturates, or avertin with amylene hydrate, to produce depression of the central nervous system in patients before the induction of anesthesia is based on sound principles. However, the type and amount of pre-anesthetic agent should be carefully selected and varied with the individual characteristics of the patient and the potency of the anesthetic agent to be employed. If the maximum effect of these agents is desired at the time of induction they must be given at the proper time.

Doses of from 8 to 16 mgm. of morphine sulfate are generally adequate if given subcutaneously from thirty to ninety minutes or intravenously thirty minutes before induction of general anesthesia. If a barbiturate is to be used in place of morphine, the amount and time of administration depends on the characteristics of the barbiturate which is to be used. Barbiturates are inferior to morphine because they do not produce appreciable analgesia in the patient, but, in contrast to morphine, these agents have certain desired effects on the autonomic nervous system. Avertin with amylene hydrate should not be considered a pre-anesthetic agent in the usual sense because of the large amount generally used.

Atropine and scopolamine exert inhibitory actions on portions of the craniosacral (parasympathetic) division of the autonomic nervous system. The usual small dose affects mainly that portion of the parasympathetic system which regulates the secretion of the salivary glands and the mucous glands in the mucosa of the oral and respiratory tracts. If the general anesthetic to be used does not cause an increase in salivary or mucous secretion these drugs are of little value. Experimental evidence indicates that the amounts of atropine and scopolamine which are usually employed as a pre-anesthetic medicament have little or no effect on the cardiac branches of the vagus nerves.

When spinal, paravertebral, or local anesthesia is to be used, a preliminary dose of morphine or of a barbiturate gives the patient mental or psychic relief. A marked fall of the blood pressure is frequently associated with spinal anesthesia or paravertebral block and is due to paralysis of the sympathetic nerves with subsequent pooling of the blood in the arterioles and capillaries. This effect may be counteracted by injection of one of the longer acting sympathomimetic amines, such as ephedrine, fifteen minutes before the beginning of anesthesia. Premedication with barbiturates protects against the cardiac irregularities produced by ephedrine and also may be of value in preventing the toxic manifestation due to absorption of local anesthesia.

The author discusses the subject of anoxia in relation to pre-anesthetic sedation. Large doses of morphine, barbiturates, or avertin with amylene hydrate may produce anoxic anoxia by depression of the respiration. Experimental evidence obtained with dogs indicates that anemic anoxia may result from the pre-anesthetic use of amytal. Stagnant anoxia as a result of spinal anesthesia may be prevented by the use of ephedrine. There is little evidence that the ordinary amounts of pre-anesthetic sedatives cause anoxia of the histotoxic type.

EDWARD W. GIBBS, M.D.

Alexander, J.: Pre-Operative and Postoperative Care of Patients with Surgical Diseases of the Chest. *Arch. Surg.*, 1940, 40: 1133.

Good results in the surgical treatment of diseases of the chest are dependent upon accurate diagnosis, and upon painstaking and careful attention to details before, during, and after operation.

Repeated and serial roentgenograms are essential to careful diagnosis and to the guidance of therapeutic and operative procedures. Bronchoscopy is essential to thoracic diagnosis, and to pre-operative and postoperative therapy in many instances.

Patients with chronic pulmonary disease are poor surgical risks and adequate pre-operative preparation is essential.

Expert anesthesia is extremely important. The author thinks cyclopropane is probably the best of inhalation anesthetics for thoracic surgery.

In postoperative management, a few things are particularly important:

1. The adequate administration of fluids, i.e., 3,000 c.cm. daily.

2. The administration of oxygen routinely after lobectomy and pneumonectomy, and in all other patients with slight cyanosis or dyspnea, or evidence of shock.

3. The prevention of paradoxical motion of the chest wall, which, when pronounced, leads to paradoxical motion of the mediastinum, and results in decreased circulation and anoxemia. These in turn increase dyspnea, which increases the paradoxical motion, and a vicious cycle is established. Labored breathing, cyanosis, a lowered blood pressure, and a rapid pulse are found, and a state of "thoracic shock" exists. To combat this, an effort should be made to steady the thoracic wall with an elastic compressive dressing; the patient should lie on the operative side, and stimulants and oxygen should be administered.

4. The aspiration of fluid and/or air in cases of pyothorax or pneumothorax after thoracoplasty is important in order to prevent the development of increased intrapleural pressure with its attendant dangers.

5. In drainage of the pleural cavity after lobectomy and pneumonectomy for infectious diseases, careful control of the intrapleural pressure is necessary and is obtained by some type of suction apparatus attached to a water-sealed bottle.

6. The evacuation of pulmonary secretions is most important. The cough reflex must not be abolished by the giving of large amounts of opiates; patients must be made to cough. Bronchoscopic aspiration of retained secretions may save patients' lives.

7. Abdominal distention increases dyspnea; it may be due to acute gastric dilatation.

8. Emphysema of the chest wall is not serious unless it is due to a tension pneumothorax, which is best relieved with a needle fixed between the ribs and attached to a rubber tube, the distal end being kept under water, or by actual suction through a catheter between the ribs.

9. Wound infection calls for wide opening of all the layers of the wound.

There are many practical points discussed in this paper and any surgeon interested in thoracic surgery should study this article in detail.

JULIAN A. MOORE, M.D.

Walters, W., and Hartman, H. R.: Pre-Operative and Postoperative Care of Patients with Lesions of the Stomach and of the Duodenum. *Arch. Surg.*, 1940, 40: 1063.

Compensation for the toxemia of dehydration with alkalosis, hypochloremia, and loss of sodium by the intravenous administration of solutions of sodium chloride with and without glucose has been a routine procedure in the pre-operative preparation of patients who have gastric or duodenal obstruction with which gastric retention of more than 300 c.cm. is found to be associated. The need for treatment depends not on the amount of gastric retention present when the study is made but on the alteration of the blood chemistry coincidental with the obstruction. The toxic state is determined by the degree of persistency of the obstruction. Intermittent obstruction, even complete obstruction intermittently, is not likely to permit a severe toxic avitaminosis or state of nutritional deficiency to develop. The administration of too much sodium chloride manifests itself by an elevation of the blood chlorides beyond normal values and, occasionally, by the development of edema of the ankles and hands. We prefer to administer the intravenous solutions by intermittent injection rather than continuously, as the latter method becomes tiresome to the patient and may produce thrombosis of the vein.

When the degree of obstruction is severe the fluidity of the diet should be increased. The liquid diet administered should be palatable and should contain sufficient vitamins; if it does not, Vitamin B and Vitamin C should be given. Vitamin K should be given if the prothrombin time is increased or if there is evidence of hepatic insufficiency which, under the strain of prolonged operation, may be responsible for inadequate maintenance of the normal coagulability of the blood.

A determination of the concentration of blood urea and blood chlorides, carbon-dioxide-combining power, and serum proteins at the start of the period of preparation with repetition of the studies after a period of two or three days will serve as an indicator of whether the toxemia due to dehydration has been controlled. One or more transfusions will be required prior to operation if anemia is extreme. The patient with an acute perforation of a duodenal ulcer usually requires an immediate surgical procedure, a part of which at least is closure of the perforation. In such cases, it is advantageous to empty the stomach with a stomach tube before performance of the operation; this is particularly advisable if the patient is to have a general anesthetic.

The postoperative care of the patient may be considered from the standpoint of routine measures to be instituted in cases in which no complication exists and from the standpoint of treatment of postoperative complications. General measures of importance are maintenance of a positive fluid balance to the extent that intake exceeds output or that there is a positive fluid balance of at least 1,000 c.cm. every twenty-four hours, or better still, from 1,500 to 1,800 c.cm. It is important to observe the urinary output and its specific gravity each day, for a low urinary output may mean insufficient fluid intake or urinary retention. If gastric retention is present in amounts of not more than from 800 to 1,000 c.cm. during a twenty-four-hour period, intermittent emptying of the stomach by aspiration may satisfactorily tide the patient over the period of retention.

Pulmonary complications subsequent to operation usually consist of atelectasis, bronchopneumonia, or pulmonary embolism. Although it may be believed that atelectasis occurs more frequently after general anesthesia, experience has shown that it occurs probably with as great a frequency following the use of spinal anesthesia. The patient who has atelectasis should be placed immediately on the side corresponding to the undisturbed lung and should be changed frequently from his back to this position, in the hope that in this fashion, and by encouraging him to cough, the plug of mucus that obstructs the bronchus will be dislodged. Placing a hand on each side of the patient's thorax and compressing it when he starts to cough is very helpful to the patient in expelling mucus from the bronchi. Inhalations of carbon dioxide and oxygen (95 per cent oxygen and 5 per cent carbon dioxide) after a short time at frequent intervals increase the depth of expiratory excursion and will assist, first, in dislodging a plug of mucus and, second, in inflating the collapsed portion of the lung. Oxygen is particularly valuable in these cases as it decreases the respiratory rate and helps the patient to expel the bronchial mucus.

Clinical experience has proved that when the diagnosis of bronchopneumonia is suspected from the increased temperature and pulse rate, even in the absence of positive thoracic or roentgenological findings, the patient does better if immediately placed in the oxygen tent. As signs of the bronchopneumonia can be elicited on physical examination and demonstrated by roentgenological examination and if the patient's condition warrants, chemotherapy should be started without delay. With sulfanilamide it was our custom to give an initial dose of 75 gr. (5 gm.) in the first twenty-four hours, following it by doses of from 40 to 60 gr. (2.6 to 4 gm.) on each succeeding twenty-four hours for a period

of five or six days. At no time should the concentration of sulfanilamide in the blood be allowed to exceed 15 mgm. per 100 c.cm. With the introduction of sulfapyridine Moersch and Hinshaw have advocated the administration of from 60 to 90 gr. (4 to 6 gm.) of sulfapyridine in the first four hours, then 15 gr. (1 gm.) every four hours for a period of five or six days. If it is necessary to institute chemotherapy in the first forty-eight hours subsequent to operation, when the patient is not taking fluids orally, the sodium salt of sulfapyridine is given intravenously; 0.06 gm. per kgm. of body weight is given and repeated every six to eight hours. Estimations of the concentration of these substances in the blood are made at frequent intervals to prevent overdosage. Reëxaminations of the blood should be made to eliminate too great a drop in the number of leucocytes, and repeated examinations of the thorax, particularly roentgenological, are made to ascertain whether fluid has developed in the pleural cavity or if empyema is present. In our experience, such complications are extremely rare.

Various methods of reducing the incidence of fatal pulmonary embolism have been attempted and carried out, among which are the standardized frequent moving of the patient from side to side, elevation of the foot of the bed, the administration of thyroid extract, and, more recently, the intravenous use of purified heparin. Although in large series of cases these various methods have been used to decrease postoperative fatal embolism (all of which methods have value), the fact remains that fatal pulmonary embolism continues to occur, but fortunately it occurs infrequently and is, it would seem, one of the few remaining unsolved problems pertaining to the treatment of postoperative complications.

In many cases in which pyloric obstruction prevents a proper intake of nourishment and fluids prior to operation and the patient is in a state of malnutrition, a catheter introduced into the stomach through the nose or mouth is carried through the stoma of the anastomosis at the time that the anastomosis is made and is placed in the distal loop of the jejunum or in the duodenum if an operation of the Billroth I type is performed, so that feedings can be begun immediately subsequent to operation. This is of particular value in cases of long-standing pyloric obstruction in which partial gastric atony has occurred and efficient emptying of the stomach is delayed postoperatively. We have been using a formula which has a composition of 15 gm. of carbohydrates, 4 gm. of protein, and 14 gm. of fat. Most mixtures of ice cream contain constituents in this proportion and are made up of whole-milk powder, cream or butter fat, egg powder, and gelatin. The mix is homogenized and has been more successfully employed for use in a jejunostomy tube than a former mixture of milk and cream which occasionally produced some diarrhea. More normal stools have resulted in cases in which the ice-cream formula has been used. To the mixture is added concentrates of Vitamin K, ascorbic acid, halibut liver oil, and thiamin chloride. The method of preparation of the formula is as follows:

Mix skimmed-milk powder with water to make a smooth paste. Add the remainder of the water, the glucose, and the ice-cream mix. Beat the eggs, add halibut liver oil, and beat again. Combine the mixtures, strain, and add dissolved ascorbic acid and thiamin chloride. Individual feedings should be warmed in hot water to body temperature.

Paine, J. R.: Pre-Operative and Postoperative Care of Patients with Lesions of the Small Intestine and of the Colon. *Arch. Surg.*, 1940, 40: 1083.

Surgical lesions of the small intestine and colon may be classified under three heads: (1) inflammatory lesions, such as appendicitis, regional enteritis, diverticulitis, and ulcerative colitis; (2) obstructive lesions, which may be taken to include the various pathological types of obstruction, partial or complete; and (3) neoplasms not producing obstructive symptoms.

Recently much improvement has been made in pre-operative and postoperative care because of an ever-increasing appreciation of the importance of deficiencies in Vitamins B and C. When Vitamin B is found to be lacking, as evidenced by pre-operative atony of the gastro-intestinal tract with its accompanying symptoms, the author advises the daily administration, orally or intramuscularly, of 10 gr. (0.65 gm.) of thiamine chloride and 100 mgm. of nicotinic acid. When Vitamin C is deficient, as determined by the quantity of ascorbic acid in the blood and urine, 100 mgm. of ascorbic acid are given daily by mouth or hypodermically.

The rôle of plasma proteins has recently been emphasized, especially when there is obstruction at the site of anastomosis, or in the instance of evisceration or poor postoperative wound healing. When the level of blood proteins falls below 7.5 gm. per 100 c.cm., edema occurs, which may give rise to the afore-mentioned postoperative complications. At present, the safest and most effective way to raise the level of blood proteins is by transfusion of whole blood or blood plasma.

The importance of the judicious administration of fluids, both pre-operatively and postoperatively, is emphasized. Determination of the blood chlorides before operation, and the status of dehydration and alkalosis are of unquestionable value. As a working rule, the author has found it feasible to give fairly routinely each day postoperatively 1,500 c.cm. of physiological solution of sodium chloride in the morning and 1,500 c.cm. of 5 or 10 per cent dextrose in distilled water in the afternoon or evening. Fluids administered parenterally are of importance for at least from four to six days following surgery on the gastro-intestinal tract, but care must be taken that edema from excess amounts of saline solutions be avoided. Older patients are given hypodermoclysis. Proctoclysis has fallen from favor, but is of value in isolated instances.

Recent developments in the prophylactic treatment of postoperative peritonitis are reviewed. These include the vaccine developed by Bargin, colibactragen developed by Steinberg, intraperitoneal injections of sodium recinoleate (Rea), amniotic fluid, and immunotransfusions of serum. The author admits very little experience with these measures. Roentgen irradiation has been advocated in certain patients with peritonitis. Sulfanilamide is to be considered a worthwhile addition to the present inadequate means of treatment of peritonitis.

Postoperative treatment has been improved in recent years with such measures as decompression by gastroduodenal aspiration, inhalation of high oxygen concentrations, and the use of drugs, including prostigmine, physostigmine, mecholyl, pitressin, and a solution of extract from the posterior lobe of the pituitary gland. However, such drugs should find little place in the postoperative phase of surgical therapy of the intestine if appropriate measures are taken to prevent the development of distention.

Morphine sulfate, 1/6 gr., is given every four hours as needed postoperatively for about forty-eight hours. Tracheal aspiration during the immediate postoperative period is of major significance in allaying pulmonary complications. The Trendelenburg position after a prolonged, deep anesthetic assures good drainage of the bronchial secretions, and aids in the treatment of postoperative shock. Adequate blood transfusions should be given in cases of shock. Active movements should be encouraged from the beginning of the postoperative period, aided by turning of the patient every hour as soon as he is awake. Elderly patients tolerate surgical procedures better if kept in an oxygen tent for the immediate postoperative period. HAROLD LAUFMAN, M.D.

Cot and Genaud: The Installation of Oxygen Therapy Supplied by Liquid Oxygen. (Installation d'oxygénothérapie collective alimentée par l'oxygène liquide). *Presse méd.*, Par., 1940, 48: 361.

The authors have devised a method of oxygen therapy which utilizes compressed or liquid oxygen. They believe that this method with liquid oxygen will be useful in metropolitan communities, and with compressed oxygen in isolated communities. The initial cost may be somewhat high but this is balanced by the ease of replenishing the supply of oxygen with containers of compressed oxygen.

FREDERIC W. ILFELD, M.D.

Howes, E. L.: A Renaissance of Suture Technique Needed. *Am. J. Surg.*, 1940, 48: 548.

The use of silk as a ligature and suture material has recently gained widespread prominence. Halsted many years ago used fine silk with excellent results. These results were due not only to the use of silk, but also to the proper technique for the use of this material. The author stresses the importance of selecting the proper suture material and employing a careful technique. The following pertinent points are emphasized:

1. Suture the cut edges to obtain healing in the shortest possible time after the infliction of the wound rather than to secure them as safely as possible.

2. Sutures must not be made the agents for transplanting bacteria into the wound. Sutures pick up bacteria (a) by being soaked in a basin previously used to wash instruments coming from the wound; (b) by coming in contact with exposed skin edges; and (c) from repeated handling.

3. Sutures should not be inserted and tied in such a manner as to create necrotic tissue in which the bacteria may grow. The bite of tissue included in the suture should be about three-eighths of an inch when tied, and tied loosely. The edema that develops in the wound during the first forty-eight hours tightens the sutures further. The tightness required for skin sutures should be used as the guide for the tightness of deep sutures. The redness and infection which develop around the skin suture tied too tightly indicate the effect of the same degree of strangulation on the more easily necrotized muscle and fat. Large tufts of tissues should not be tied off by ligatures. The tuft should not be visible. Excellent wound healing results when healthy cells are placed in contact with healthy cells. Because of the danger of necrosis resulting from tension on the sutures, layers of tissues which will not lie together should not be sutured together. Rather than attempt to approximate tissues under tension by means of sutures, one should release tissues by plastic incisions, or not suture them at all.

4. Traumatic wounds seen eight hours or more after infliction should not be sutured, because bacteria have already begun to multiply.

5. Sutures should be used sparingly; they are foreign bodies and as such aid in developing a bacterial infection. The common error is to use too much suture material and, especially, too large sizes. Because of the inability of the tissues to hold larger sutures, there is no need to use a suture larger than No. 0 catgut or its equivalent size of silk. Exceptionally, a larger strand may be needed to set the knot, but not to hold the tissues.

6. In order that sutures may be used sparingly and yet have the greatest mechanical advantages, interrupted sutures should be used with triple throw knots, all tied square. Tissues having the greatest holding power for the sutures, or possessing a mechanical advantage, should be sutured—the peritoneum, the fasciæ, and the skin. The rest of the tissues do not need to be sutured, except under special circumstances. The suture should be of such a type that it pulls at right angles to the tissue fibers and not parallel to them.

7. The clean wound made to drain an infected focus, as, for example, an appendiceal abscess, should not be contaminated during operation. Laparotomy pads provide protection, and suction should be used to remove the pus. After the peritoneum is closed, the wound is treated as a traumatic wound, freshly contaminated, namely, by irrigation and débride-

ment. Subsequent drainage seeps less between the layers if the drains are placed at one end of the wound. There is no need for the defeatist attitude that all such wounds become infected and therefore the layers above the peritoneum should be left open to heal by secondary intention.

8. The skin edges should be everted by the sutures.

9. Attention to details and meticulous care in handling the tissues, instead of haste, cannot be overemphasized. The surgeon may save five or ten minutes in closing the wound rapidly, whereas the patient may lose several weeks, and his life may be endangered, in fighting an infection.

MANUEL E. LICHTENSTEIN, M.D.

Perrone, J. A.: Bronchoscopy as a Treatment of Postoperative Atelectasis. Report of 90 Cases. *Ann. Otol., Rhinol. & Laryngol.*, 1940, 49: 528.

This author reports on 90 cases of atelectasis which occurred during a period of six years when about 21,000 operations were performed. He states that he is amazed at the rarity with which the bronchoscopic treatment is mentioned in the literature. He believes that fear can be completely discounted as a risk if the procedure is done by a trained bronchoscopist.

Sixty-five patients were male. The youngest was seven years, the oldest eighty-five. Most commonly the condition followed operations on the upper abdomen, particularly those on the stomach and the biliary tract. Atelectasis follows any type of anesthesia, even spinal and local. Seventy-four patients had their onset between thirty-six and forty-eight hours after the operation, 3 in less than twelve hours, 2 after three days, and 1 on the sixth day.

The earliest manifestation of atelectasis of the lung is the elevation of the temperature, which in the first few hours may fluctuate between 99 and 100 degrees, and then suddenly rise to 102 or more. The characteristic respiratory symptoms observed in the order of their frequency are dyspnea, cyanosis, rapid pulse, and pain in the chest. Expansion of the chest is limited or absent over the affected area. Often the interspaces appear retracted. The heart and trachea may be drawn toward the affected side. There is early hyperresonance but as the secretion increases dulness is noted. At first the breath sounds are absent or diminished, but later there is tubular breathing with moist bubbling râles.

The roentgenological findings in early atelectasis reveal little or no increase in density over the lung; later the shadow may be dense and homogeneous.

As a preventive measure during the operation the use of suction for removing secretions that have collected in the pharynx, nasopharynx, and trachea cannot be overemphasized. Light narcosis should be used whenever possible in order to preserve the cough reflex. The use of carbon-dioxide-induced hyperventilation for de-anesthetizing on the operating table following inhalation anesthesia is a great aid, but by no means does it prevent atelectasis. The postoperative positions of the patient in bed are important. The position for least impediment to the respiration and for greatest vital capacity is the Fowler position. The postoperative effect of drugs diminishes respiratory movements and the vital capacity and abolishes the cough reflex, which is not beneficial. Tight dressings and binders should be avoided. Abdominal distention should be prevented.

The treatment consists of stopping all sedatives, encouraging the patient to cough, and moving him from side to side in bed. Carbon-dioxide inhalations may be given. If no improvement takes place in from eight to ten hours bronchoscopy is done and the mucus plug is removed.

Bronchoscopic aspiration results in a sudden drop of the temperature, in the pulse, and in the respiratory rate. The patient almost immediately feels relieved of dyspnea and is able to cough up any secretion which has not been aspirated.

J. DANIEL WILLEMS, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Charbonnier, A.: Generalities in Regard to Penetrating Wounds of the Abdomen in War Surgery (Généralités sur les plaies pénétrantes de l'abdomen en chirurgie de guerre). *Rev. méd. de la Suisse Rom.*, 1940, p. 357.

Charbonnier notes that most of the war-wounded with penetrating wounds of the abdomen die either on the battle-field or during transportation to the hospital. Many of those who reach the field hospital are in a state of shock, yet shock as well as nausea and vomiting may be absent in the first few hours; severe pain may be the chief symptom. If vomiting is an early symptom, it is a definite indication of injury to an abdominal organ. Vomiting developing later indicates a beginning peritonitis. The diagnosis is evident in cases of large open wounds. However, frequently the point of entry of the projectile is indicated only by a small wound, and there is no definite indication that the peritoneum or any organ has been perforated. There are two definite physical signs that indicate a visceral lesion: localized or generalized contracture and rigidity of the abdominal muscles including the diaphragm; and cessation of intestinal peristalsis. If neither of these signs is present, it is practically certain that there is no lesion of the gastro-intestinal tract; internal hemorrhage may be present, as the presence of blood does not necessarily cause irritation of the peritoneum with resulting muscular rigidity. If there is no generalized peritonitis the muscular rigidity may be localized, and this may indicate the organ that has been injured. In some cases the diagnosis does not become evident until the state of shock is relieved. If the typical symptoms of internal hemorrhage are present, immediate operation is indicated. However, if the patient is in a state of shock, operation is not indicated. If the wounded patient is seen as late as twelve hours or more after the injury,

and his condition is relatively good, with no alarming symptoms, it is evident that there is no penetrating injury of the digestive tract. A change in the facies, vomiting, oliguria, weakening pulse, and abdominal rigidity with meteorism and peristaltic silence are evidence of a developing peritonitis.

When the initial state of shock has been relieved, operation is indicated in the presence of any symptom of injury to the thoracic or abdominal organs. The incision should be large enough to permit of thorough exploration; if the wound of penetration is large, it may serve as the route of access. Otherwise, a median abdominal incision is employed. The projectile, other foreign bodies, blood, and exudate (if present) are removed from the peritoneal cavity, which is then irrigated with physiological saline solution, and the lesion of the peritoneum is repaired. Then the gastro-intestinal tract and abdominal organs are carefully inspected and the necessary procedures (sutures, resections, anastomoses, operations for exclusion, exteriorization, and hemostasis of the mesentery) are carried out according to the conditions found. If the spleen is injured, splenectomy may be done; but nephrectomy should be avoided unless the kidney is practically destroyed. If the thorax is injured, a supplementary thoracotomy should be done, the diaphragm sutured, and the pleura drained. There is a difference of opinion in regard to drainage of the abdominal wound in such cases, but in war surgery with the constant danger of infection from the penetrating wound, the author favors drainage. The results of treatment of penetrating wounds of the abdomen depend chiefly upon the time at which operation is done. If operation is done within twelve hours, the percentage of recoveries is double that obtained with operation between the twelfth and the twenty-fourth hours. Recovery is very rare if operation is done after twenty-four hours. ALICE M. MEYERS.

Baillat, G.: The Treatment of War Fractures in Occlusive Plaster Casts (Le traitement des fractures de guerre par l'appareil platré occlusif). *Rev. d'orthop.*, 1939–1940, 26: 656.

Baillat notes that the treatment of war fractures by immobilization in occlusive plaster casts was used in the recent Spanish civil war, and is known as the Spanish method. When the Spanish refugees reached France, many of the wounded still wore these plaster casts, and were in very poor condition. This method of treatment, therefore, has been much criticized on the basis of the poor results observed in these cases. The method should not be judged on this basis, however, as these Spanish soldiers had not been under any medical supervision in the confusion of the retreat, and careful supervision is essential for the success of this method of treatment. In many cases the primary surgical treatment had also been insufficient and the primary treatment is another important factor in the results obtained with this method.

On the contrary, the results reported by Trueta I. Raspall from his hospital in Barcelona have been very satisfactory; here the primary surgical treatment and the supervision of the patients could be carried out properly. The fracture was reduced with an extension apparatus, and the plaster applied over a few layers of gauze so as to immobilize, if possible, the two nearest joints. The first plaster cast was not left in place more than from ten to fifteen days and the second, from twenty to thirty days; the third was left in place for one month. Infected tissue was not left in the fracture area; if this was done, it was necessary to open the plaster to secure drainage, and then replace the plaster. In the 615 cases treated by Trueta according to this method, amputation was necessary in only 1 case, and the functional and orthopedic results were usually satisfactory. Pseudarthrosis developed in 3 cases because of excessive loss of tissue, and stiffness of the joint resulted in a few cases, especially in the knee or elbow. There were 2 cases of complete ankylosis of a joint.

The author has used this method in the treatment of fractures in civil practice as well as in war wounds in the Spanish civil war. The results, after appropriate surgical treatment, were good in the majority of the cases. He is convinced that if this method is correctly used in suitable cases it is of definite value in the treatment of war wounds.

ALICE M. MEYERS.

Legroux, R.: The Prevention of Infection in War Wounds by Chemotherapy (Chimioprévention de l'infection bactérienne des plaies de guerre). *Mém. Acad. de chir.*, Par., 1940, 66: 415.

In a preceding communication the author stated that (1) the infectibility of a wound depended upon the amount of culture medium created by the dead tissue present, and (2) it was difficult to envisage any therapeutic effect from antibodies injected into the general circulation, and, therefore, surgical ablation of this tissue was the most important single therapeutic procedure. The present report, however, shows the therapeutic and preventive value of paraminophenylsulfamide (1162F) in such wounds.

It was shown during the World War that the most common fatal bacterium was the hemolytic streptococcus. The anaerobic gas-forming organisms were infrequent but very lethal when they occurred. The present experiments tested both of these organisms. Rabbits were used for the streptococcus tests and guinea pigs for the anaerobe tests. Pure cultures of from twelve to fifteen hours' duration were used in the crushed adductor muscles of the animals. Rabbits infected with streptococci died in from eighteen to forty-eight hours. From 0.3 to 0.6 gm. of the sulfamide applied to the surface of the crushed muscle at the same time as the organisms prolonged life to three or four days. If the animals were treated by the oral route with the sulfamide from one and one-half to two days before the probable date of death they survived. The author believes that penetration of the drug into the system has a stronger antistreptococcic effect than that obtained by local administration of the drug to the wound.

Infection of guinea pigs in the same manner with the bacillus perfringens or the bacillus histolyticus resulted in death of the controls in two or three days but the animals receiving sulfamide locally did not die until the fourth to seventh day. If the sulfamide was applied at varying intervals after the infection, death occurred in three or four days except in those receiving the sulfamide only one hour after infection. These lived six days. If the sulfamide was given by mouth at the same intervals after infection the animals died as quickly as the controls. This may possibly be explained by the fact that the anaerobes cause more localized processes and are less accessible to systemic medication than the streptococci. Similar experiments with the tetanus bacillus showed a slight prolongation of life but no prevention of a fatal outcome in the animals treated with the sulfamide.

The author believes that sulfamide is of great value in preventing streptococcus infection, of some value in the prevention of anaerobic infection, and of no value in the prevention of tetanus.

The only ill effect of the sulfamide in several hundreds of cases of meningitis was agranulocytosis.

The author believes that sulfamide should be used locally and by mouth in all war wounds. All wounded at first-aid stations should take 2 gm. of sulfamide by mouth. RICHARD WARREN, M.D.

Rouquès, L.: Tetanus; Vaccination and Sero-vaccination; Course Pursued in the Wounded; Onset of Tetanus; Partial Tetanus of the Extremities; Sero-Anatoxin Therapy (Le tétanos; la vaccination et la séro-vaccination; conduite à tenir chez les blessés; le début du tétanos et les tétanos partiels des membres; la séro-anatoxithérapie). *Presse méd.*, Par., 1940, 48: 497.

In 1923, Ramon discovered that tetanus toxin, like diphtheria toxin, could be transformed by the combined action of formaline and heat into a specific anatoxin toxoid for vaccination against tetanus. Further investigations established that immunity against tetanus could be produced by the administration of three subcutaneous injections separated by intervals of one or several weeks.

The number of vaccinated subjects has become considerable. In May, 1939, Ramon estimated that 1,500,000 and more than 800,000 soldiers had been vaccinated in France. Anti-tetanus vaccination has been introduced in the English army and is compulsory in both the Italian and French armies. No case of tetanus has been reported among the vaccinated individuals.

In previously vaccinated patients with wounds likely to lead to tetanus an injection of tetanus anatoxin is given, which produces a considerable increase in the titer immunity. If there is some doubt regarding the previous vaccination it is wiser to administer simultaneous injections of antitetanic serum and anatoxin. In wounded patients not previously vaccinated subcutaneous injections of 1 c.cm. of tetanus anatoxin is administered and immediately followed by 3,000 units of tetanus antitoxin. Two weeks later 2 c.cm. of anatoxin are injected, and two weeks after this a third injection of 2 c.cm. of anatoxin is given.

The author draws attention to the early signs of tetanus, emphasizing particularly the exaggeration of local reflexes in the region of the wound.

Partial tetanus of the extremities is characterized by muscular and reflex hyperexcitability. It usually occurs in patients who have received serum early. The incubation period is usually long, commonly three or four weeks, and occasionally two or three months or longer. The patient complains of pain, cramps, and stiffness in the wounded extremity. Examination reveals hypertonic firm muscles, resistance to passive motion, active reflexes, and, not infrequently, clonus. The temperature is usually normal and the pulse rate may be slightly elevated. The prognosis is favorable although in some cases the disease may become generalized and lead to death.

The two important considerations in the treatment are serotherapy and sedation. The author is of the opinion that chloroform anesthesia is best, although chloral hydrate may also be used. Serum should be given by the intramuscular and subcutaneous routes. The efficacy of intravenous and intraspinal routes is controversial. The simultaneous administration of antitetanic serum and anatoxin should be employed as advised by Ramon and Kourilsky. As soon as the diagnosis is made a massive dose of 150,000 units of antitetanic serum is given and one dose of 2 c.cm. of anatoxin. This is followed by increasing doses (2, 4, and 6 c.cm.) of anatoxin at intervals of five or six days. The author emphasizes the importance of eradication of the primary focus and removal of all foreign bodies.

MICHAEL DEBAKEY, M.D.

Bieling, R.: The Bacteriology and Serology of Gaseous Edemas (Die Bakteriologie und Serologie der Gasoedemerkrankungen). *Deutsche Mil. arzt*, 1940, 5: 50.

The toxin formation of gas bacilli is of practical interest and varies with the different bacteria, but, as far as is known, the ferment formation (collagenase, anaerodase, di- and monoaminopolypeptidases) is more or less common to all. The toxins formed by the Fraenkel bacillus include hemotoxin, cutaneonecrotic toxin, and general toxin, and those formed by the para-anthrax bacillus include hemotoxin, cutaneonecrotic toxin, heart and kidney toxins. The toxin formed by the bacillus edematicus (Novy) is the edema toxin A, while the bacillus histolyticus has a specific toxin. A table is presented listing the mobility, type of proliferation, toxins, and ferments of all gas-producing organisms.

The effect upon the blood vessels produces the edema, in which the bacteria swarm like schools of fish. The involved muscular tissue retains its regenerative capacity as long as the circulation is not completely obstructed. At this stage long incisions into

the muscle are still helpful. If, however, necrosis of the muscle has begun, the destructive gangrenous transformation is accelerated by the ferments. Toxinemia is favored by the absence of vascular thrombosis and by the M. Clean diffusion-favoring factor formed by the gas-bacilli themselves.

The plan of treatment is as follows:

1. Earliest possible surgical toilet of the wound to remove all dead tissue.

2. Early prophylaxis (within the first four hours at the nearest dressing station) with subcutaneous injection of at least 20 c.cm. of gas-edema serum.

3. Late prophylaxis in the particularly threatened muscle wounds on the operating table by the intravenous injection or infusion of 100 c.cm. of gas-edema serum under anesthesia (at the field hospital or main dressing station).

4. Treatment of manifest gas edema by repeated infusions of this type.

Deep antisepsis with vuzin and the peroral administration of prontosil require further trial.

(Franz). Edith Schanche Moore.

ANESTHESIA

Sise, L. F.: The Management of the Patient under Spinal Anesthesia. *Surg. Clin. North Am.*, 1940, 20: 631.

The author stresses the importance of careful supervision of the patient by a competent anesthetist after spinal anesthesia has been administered, because of the potentially dangerous complications which may arise during the first half hour.

A slight fall in the blood pressure may be normal, but to what extent a fall may occur without detriment to the patient is questionable. The author finds that, rather than the blood pressure alone, appraisal of the general condition of the patient is the only reliable guide to his progress. A dulling of the intellect, pallor, diminished pulse volume, shallow respiration, and cool extremities suggest need for supportive treatment. The least trace of cyanosis calls for instant treatment. The most effective measures are the use of a slight Trendelenburg position, the prophylactic use of ephedrine, or a mixture of 5 units of pitressin and 25 mgm. of ephedrine given subcutaneously or intramuscularly, intravenous saline infusion, and the avoidance of such procedures as traction on the gall-bladder pedicle or gastric omentum or manipulation of the liver, which cause profound alterations of the blood pressure. It has been noted that the fall in blood pressure will not be as severe if the patient is put under general anesthesia a little before the shocking portion of the procedure is started. The intravenous administration of pentothal sodium has been found suitable.

Nausea with vomiting seems to be due largely to certain surgical procedures associated with a drop in the blood pressure rather than to the anesthesia itself. When vomiting has begun, palliatives such as oxygen, cold compresses, and deep breathing will not help and only a general anesthetic will stop it. Pentothal sodium is a good preventative before vomiting has started, and either pentothal or cyclopropane will usually terminate it. Depressed or arrested respiration may be caused either peripherally, from paralysis of the muscles of respiration, or centrally, from depression of the vital centers. It is important that the anesthetist keep a close watch on the amount of intercostal paralysis. As intercostal paralysis progresses upward chest motion becomes less, while abdominal motion increases. When chest paralysis becomes complete the chest is sucked inward during inspiration by the powerful action of the diaphragm. When the diaphragm becomes paralyzed, and, finally, the accessory muscles, respiratory paralysis is complete. These changes can be easily followed by the trained anesthetist. It is wise to administer oxygen as soon as intercostal paralysis becomes evident. If breathing becomes more seriously affected, some assistance to inspiration by gentle pressure on the breathing bag is used, and if paralysis progresses, complete artificial respiration by rhythmic bag pressure with a closed carbon-dioxide-absorption system is indicated.

Central failure of respiration is more serious, and in addition to supplying oxygen one must immediately treat the fall in blood pressure. The Trendelenburg position must be assumed, and pressor drugs administered.

Restlessness during the operation may be counteracted by a sufficient amount of preliminary medication which puts the patient in a drowsy and "don't care" attitude. Occasionally, a supplementary dose of morphine and scopolamine or barbiturate (pentothal) given intravenously, or gas anesthesia is required. It is probably wise not to exceed a dose of ⅛ gr. of morphine and 1/200 gr. of scopolamine, or of 1 dg. of pentothal sodium to begin with.

John A. Gius, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Sereghy, E.: The Sterilization of Solutions, Syringes, and Needles, and a New Drum for the Sterilization of Syringes with Steam Pressure (Ueber Sterilisierung der Injektionsloesungen, Spritzen, Nadeln und eine neue Sterilisations-Trommel zur Sterilisierung von Spritzen im Ueberdruck-Wasserdampfe). *Orvosképzés*, 1939, 29: 104.

Most of the ampoules produced by manufacturers, sterilized either by heat or filtration, are considered as being free of bacteria. According to the author this is not always true. Those sterilized by fractional sterilization (tyndallization) and those made free of bacteria by means of the bacterial filter cannot be considered as absolutely sterile. This statement is even more applicable to aseptically prepared solutions.

For the sterilization of syringes and needles the following methods are usually employed:

1. After washing with ether they are placed in alcohol and kept there until used.

2. Boiling in water at 100° C. for from ten to fifteen minutes and then preserved in alcohol.

3. Boiling in water at 100° C. for from ten to fifteen minutes and immediate use.

4. Boiling in from 3 to 5 per cent soda solution in water for fifteen minutes, sterile rinsing, and immediate use.

5. Sterilization for from six to ten minutes with superheated steam at from 120 to 126° C. under from 2 to 2.5 atmospheric pressure.

6. Sterilization with dry heat at 160° C. for one and one-half hours and at 180° C. for one-half hour.

The author considers the Methods 1, 2, and 3 as far from satisfactory.

For the proper sterilization of syringes with superheated steam he has constructed a new drum divided by partitions into ten equal parts which are separated from each other. Each compartment can be opened by a separate metal door, and is large enough to hold a 2 to 5 cm. syringe with its necessary needles, all wrapped in gauze. In the floor and roof of the drum there are openings for the circulation of the steam. After sterilization these openings can be closed securely.

In conclusion the author states: saprophytic bacteria with high resistance against heat can, even if rarely, induce very severe and fatal infections. The very resistant pathogenic anaerobes occur everywhere. It is, therefore, not sufficient that instruments, syringes, needles, and bandages are made relatively free from living organisms, but all living organisms must be destroyed. Absolute sterility is achieved by boiling at from 120 to 126° C. for from six to fifteen minutes in superheated steam under from 2 to 2.5 atmospheric pressure, or by exposure for one-half hour to dry heat of from 160 to 180° C.

The source of infection after an injection may be the injection fluid, improper opening of the ampoule, unclean application of the injection needle, the skin of the patient, the hand of the surgeon, the syringe, the needle, the tissue damage caused by the solution injected, to which the latent organisms or those circulating in the patient's blood stream attach themselves, and, finally, the point of injection, which may become a locus minoris resistentiæ in which the circulating organisms may multiply.

Only solutions in ampoules should be employed. It is necessary that the manufactured ampoules should bear not only the date of manufacture, but the method of sterilization used, as well as the chemical reaction of the solution, the quantity of the preserving material, and the signs of beginning spoilage.

A complete dependable sterilization of the syringe and needles is obtained only by boiling them under pressure, with superheated steam, or with high dry temperatures. The method advocated by Habs—boiling for fifteen minutes in from 3 to 5 per cent soda solution and rinsing with sterile water—can be considered only a makeshift. Alcohol should be stricken from the list of sterilization fluids. In debilitated and septic patients an intramuscular injection should be avoided altogether.

(E. Illés). Leo A. Juhnke, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Robins, A. B., and Ehrlich, D. E.: Group X-Ray Surveys in Apparently Healthy Individuals. *Radiology*, 1940, 34: 595.

Although group x-ray surveys of convicts and suspects have been and are frequently made in connection with the tuberculosis problem, such studies confined to large numbers of apparently healthy individuals are lacking. Through the co-operation of various agencies the authors have been able to subject over 73,000 individuals to such a study. They present their findings in considerable detail in this paper.

In choosing the method used for these group examinations, the authors were influenced by the following considerations:

The procedure must accurately diagnose tuberculosis in the minimal stage, and this can be done only radiologically; it must be adapted to the rapid examination of large numbers of individuals; it must be possible to carry out the studies in central locations, such as schools, institutions, or clinics, and the examiners must be able to move readily from one location to another; the results must be of good technical quality, readily capable of interpretation and review, and the cost must be low. The methods considered included tuberculin test, screening, fluoroscopy, x-ray examination on celluloid film, and the rapid roll-paper method. Only the roll-paper method satisfied all of the requirements, and it was adopted. All of the material presented in this paper is drawn from surveys performed by this method.

The choice of groups to be studied was guided by the mortality and morbidity statistics on the influence of tuberculosis by age, sex, race, and economic status. Among those so examined were preadolescent children, high school and university students, applicants for employment in the Health and Fire Departments, persons suffering from venereal disease, homeless and non-settled males, prisoners, and the population on home relief in certain sections of New York City. The incidence of tuberculosis in some of these groups is illustrated by graphs, as is also the occurrence of certain nontuberculous conditions, including cardiac and osseous abnormalities. Each individual group is given separate consideration and the entire number are discussed and analyzed statistically.

From the material studied, the following summary and conclusions are arrived at by the authors:

1. Group x-ray examinations of apparently healthy individuals are a productive method of finding tuberculosis cases, and should be a part of the program of all large public health organizations.

2. In such studies the incidence of clinically significant pulmonary tuberculosis varies with the age, sex, race, and economic level of the population studied.

3. The incidence of active tuberculosis in Negroes is lower than in whites among the apparently healthy population.

4. The major portion of our efforts should be expended on adults and groups of the low economic levels.

5. The majority of the cases are discovered in the minimal stage of tuberculosis.

6. Abnormal cardiac outlines significant of organic disease of the heart or vessels are found in a sufficiently high percentage of cases to warrant the universal use of roentgenography.

7. In rapid examinations of large groups, the roll-paper method is the procedure of choice from the point of view of convenience, accuracy, and economy.

ADOLPH HARTUNG, M.D.

Dyke, C. G., and Davidoff, L. M.: The Pneumo-Encephalographic Appearance of Hemangioblastoma of the Cerebellum. *Am. J. Roentgenol.*, 1940, 44: 1.

In 1926 Lindau described the occurrence of hemangioblastic tumors of the cerebellum which consist of a large cyst with a small mural nodule of solid tumor. The combination of cerebellar hemangioblastoma, angiomatosis of the retina, and tumors elsewhere has since received the name of Lindau's disease.

The plain roentgenograms in cases of hemangioblastoma of the cerebellum usually reveal only slight atrophy of the posterior clinoid processes, and of the floor and dorsum of the sella turcica. The characteristic features of the pneumo-encephalogram in hemangioblastoma of the cerebellum are dilatation and rostral bending of the caudal half of the aqueduct of Sylvius, marked narrowing of the cisterna pontis and, usually, absence or marked compression of the fourth ventricle. There is usually present a certain degree of internal hydrocephalus involving the entire ventricular system rostral to the site of tumor. The degree of dilatation of the lateral ventricles is usually somewhat asymmetrical. The third ventricle is moderately enlarged and not displaced.

The explanation of the characteristic changes in the aqueduct of Sylvius and in the cisterna pontis is that the tumor, if in the vermis, is located either in the region of the declive or superior to it, or, if in the lateral hemispheres of the cerebellum, occupies an increasingly superior position. The superior location of the tumor accounts for the difficulty, often insuperable, in disclosing the lesion at a primary operation. A suboccipital decompression permits the tumor to migrate caudally in the direction of the bony defect, presumably because of lessened resistance. The authors have found that in some instances

in which the tumor was inaccessible at a primary operation, re-operation at some later date revealed it to be within the operative field and readily amenable to surgical removal.

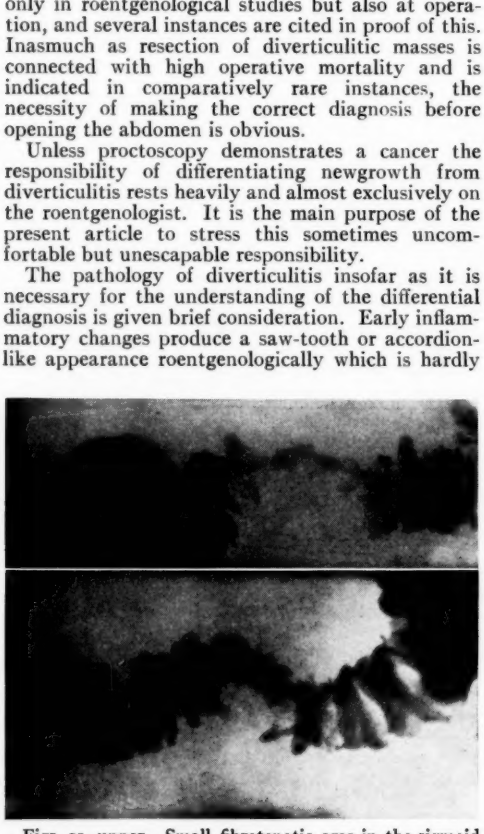
HAROLD C. OCHSNER, M.D.

Schatzki, R.: The Roentgenological Differential Diagnosis Between Cancer and Diverticulitis of the Colon. *Radiology*, 1940, 34: 651.

The difficulty of differentiating changes produced by inflammatory processes in some cases of diverticulitis of the colon from neoplastic disease is generally recognized. Numerous investigations have helped to decrease these diagnostic difficulties but have not obviated them. They are encountered not only in roentgenological studies but also at operation, and several instances are cited in proof of this. Inasmuch as resection of diverticulitic masses is connected with high operative mortality and is indicated in comparatively rare instances, the necessity of making the correct diagnosis before opening the abdomen is obvious.

Unless proctoscopy demonstrates a cancer the responsibility of differentiating newgrowth from diverticulitis rests heavily and almost exclusively on the roentgenologist. It is the main purpose of the present article to stress this sometimes uncomfortable but unescapable responsibility.

The pathology of diverticulitis insofar as it is necessary for the understanding of the differential diagnosis is given brief consideration. Early inflammatory changes produce a saw-tooth or accordion-like appearance roentgenologically which is hardly to be confused with intrinsic cancer. Even the progressive changes of increasing inflammatory swelling that produce cushion-like projections which separate long-necked diverticula leave little doubt of their true nature.



Figs. 1a, upper. Small fibrotenotic area in the sigmoid due to diverticulitis. Note preserved mucosal folds in the area of narrowing. b, lower. Three months later the spasticity around the narrowing has improved; the narrowing itself is still present. Clinical data: 13 days previous to the first examination the patient was operated on under the diagnosis of acute appendicitis. The operation showed diverticulitis of the sigmoid with perforation.

Differential diagnostic difficulties arise if inflammatory masses are arranged with fair evenness throughout the wall of the intestine beneath the mucosal surface. The resulting concentric constriction usually has cone-shaped ends and extends in most cases over a fairly large part of the intestine. The wall of the intestine in the region of the cone-shaped beginning and ending of the lesion is usually not absolutely rigid, as can be seen by the changing lumen during any one examination. The constricted area itself may or may not change in size, and depends on the degree of rigidity. The mucosal folds are preserved and may or may not be swollen; the size of the lumen in the constricted area itself may vary from week to week, and depends on the amount of cellular and serous, or fibrous elements. It is characteristic of this type of lesion that in the presence of localized rigidity and of all the evidence of the lesion within the wall of the bowel, the mucosal folds are preserved, although these folds may have a rather fixed arrangement such as is unusual for the constantly changing pattern of the normal colon.

The most difficult problem in differential diagnosis arises in cases with complete obstruction. Repeated attempts with varying techniques may permit visualization of some of the involved area and help in the differentiation. Sometimes the appearance of the colon at the point of the obstruction is of great help.

In cancer of the colon the defect produced by the tumor shows sharply defined margins. Instead of the normal mucosal folds one sees the irregular tumor surface, usually with ulceration. Very commonly the colon proximal and distal to the cancer appears normal. Diverticula may be present proximal and distal to the tumor and may complicate the diagnosis, particularly in small lesions. Not only simple diverticulosis but also definite diverticulitis may be present, together with a small cancer.

Extracolonic tumors secondarily involving the colon may occasionally produce changes simulating diverticulitis or primary carcinoma. These are discussed briefly. Clinical manifestations usually help greatly in their differentiation.

ADOLPH HARTUNG, M.D.

Ettinger, A.: The Value of the Upright Position in Gall-Bladder Examinations. *Radiology*, 1940, 34: 481.

Ettinger is convinced that the use of the upright position in gall-bladder examinations increases the accuracy of diagnosis, and should be employed more frequently. Focusing the gall bladder by fluoroscopic examination to obtain the most favorable angle and degree of compression for the roentgenogram is recommended.

Ettinger maintains that biles of various concentrations which do not mix can be present simultaneously within the gall bladder, and he believes this explains some observations of normal cholecystograms which have been hitherto obscure.

As presented by the author, the diagnostic advantages of the upright position are: elimination of doubt as to whether an observed negative or positive shadow lies within the boundaries of the gall bladder or belongs to another organ; ability to determine whether calcified stones clearly seen without the dye test are freely movable or are impacted; clarification in visualizing the anatomical configuration of the gall bladder, making possible proper identification of a congenital abnormality; revelation of minute transparent stones not visible in the usual film; elimination of the possibility of duodenal air overlying the gall bladder; employment of certain angles for cases in which the dye ordinarily does not penetrate between the stones at the lower pole of the gall bladder, making diagnosis possible. Roentgenograms to illustrate each diagnostic advantage are presented. EARL GARSIDE, M.D.

Graziani, A.: The Roentgenological Examination of the Carpus (L'esame radiologico del carpo). *Radiol. med.*, 1940, 27: 382.

A detailed analysis is made of the routine x-ray examination of the carpus and of the points imperfectly clarified by it. Modifications are proposed:

In the dorsopalmar view three positions are described. In the first, the forearm is in pronation, the palm is on the casette, and the long axis of the hand is continuous with that of the forearm. The second position is like the first, the central ray still being in the middle of a line which unites the styloid process of the radius with that of the ulna, but the hand is in ulnar deviation. The third position is the same, the hand this time being in radial deviation.

In the palmodorsal view, the three positions are similar to those of the dorsopalmar, with the dorsum of the hand resting upon the casette.

Examination of these projections reveals:

1. In the dorsopalmar as in the palmodorsal view, with the hand in ulnar deviation (Fig. 1), a full profile of the scaphoid is obtained without the overlapping at the base of the distal third, a frequent site of fracture.

2. In the palmodorsal position the superimposition of the capitate bone on the hamate is avoided and all the articulations of the two bones are clearly visualized.

3. With ulnar deviation in the palmodorsal position (Fig. 1) better visualization is obtained of the articulation between the hamate and the triquetral bones, along with partial dissociation of the pisiform and the triquetral bones.

4. The palmodorsal projection shows the styloid process of the ulna in the A-P position while the dorsopalmar shows it in profile, a fact which is frequently useful in designating the technique employed and in obtaining the desired visualization.

The three positions of the radio-ulnar view show the hand with the ulnar side resting upon the casette, (1) with the long axis of the hand continuous with that of the forearm; (2) with the hand in flexion; and (3) with the hand in extension.

In the ulnoradial view the three positions are as described above, the radial side of the hand resting upon the casette.

From the lateral projections the following observations may be made:

1. Optimum visualization of the pisiform bone is obtained from the ulnoradial view, the long axis of the hand continuous with that of the forearm.

Fig. 1

Fig. 1. The right wrist in dorsopalmar projection, the hand in ulnar deviation.

Fig. 2

Fig. 2. The right wrist in lateral radio-ulnar projection the hand in flexion.

Fig. 3

Fig. 3. The right wrist, oblique dorsoradial view.

2. The ulnoradial view with the hand flexed (Fig. 2) offers the best visualization of the scaphoid bone, particularly in its distal half, as well as of the articulation of the scaphoid with the greater multangular bone.

3. Both the radio-ulnar and ulnoradial views with the hand in hyperextension delineate clearly the articulation of the capitate and lunate bones.

4. The greater multangular and the lesser multangular bones are well isolated by the ulnoradial projection, with the hand in hyperextension.

5. The identification of the triquetral bone is always difficult in the ulnoradial view, with the long axis of the hand continuous with that of the arm.

With reference to the plane which passes through the styloid processes of the radius and ulna, and that of the central ray, four oblique projections are possible. The first two, the oblique palmocubital and the oblique dorsocubital, are made with the ulnar side resting on the casette. In the former, the patient's arm is slightly rotated so that the central ray passes through the wrist from the dorsal to the palmar surface, the cubital side resting on the casette; in the latter, the arm is rotated in the opposite direction so that the central ray passes from the palmar to the dorsal aspect. With the radial side resting on the casette the two corresponding oblique projections are made by rotating the forearm through 45 degrees in pronation and supination, respectively.

The best visualization of the greater and lesser multangular bones is obtained with the oblique dorsoradial projection (Fig. 3). While the oblique dorsocubital projection is not a perfect lateral projection, the carpal bones stand in almost accurate profile. The styloid process of the radius is best seen in this position.

The author suggests these modifications of the customary technique to assist in clarifying specific conditions. EDITH FARNSWORTH, M.D.

Bouslog, J. S., and Evans, J. R.: Irradiation of the Long Bones for Gynecological Bleeding. *Am. J. Roentgenol.*, 1940, 43: 871.

There is a certain proportion of cases of functional uterine bleeding in which all orthodox treatment has been used without result. The authors found that in a number of these cases the blood platelet count is low, and they have designated this condition as uterine purpura. Because of the efficacy of splenic irradiation in idiopathic thrombocytopenia purpura, they instituted this treatment in 1 such case with startling results. The uterine bleeding ceased abruptly after a duration of at least two years. The platelet count returned to normal and the patient experienced a sense of well-being.

Later, however, because no other symptoms of purpura were found in the condition under consideration, it seemed reasonable to the authors to conclude that the diminution in the number of platelets was due to a deficient formation in the bone marrow, rather than to an increased destruction by the reticulo-endothelial system. Irradiation of the long bones was consequently instituted rather than the irradiation of the spleen and in almost all instances the bleeding was relieved. Coincident with the cessation of bleeding there has been a return of the platelet count to normal. A number of cases are reported in detail. It is noted that snake venom has been used with similar immediate results but with less prolonged effects.

The amount of roentgen irradiation given has been variable, but the factors generally used were 200 kv., 50 cm. distance, and filtration 0.5 to 1.75 mm. of copper plus 1 mm. of aluminum. One hundred roentgens were given over each thigh or leg at intervals of several days. HAROLD C. OCHSNER, M.D.

Freid, J. R., and Goldberg, H.: Post-Irradiation Changes in the Lungs and Thorax. *Am. J. Roentgenol.*, 1940, 43: 877.

Eighteen cases are reported in which post-irradiation changes occurred in the lungs and thorax. This series does not represent all the cases of pneumonitis observed in the authors' clinic. Of the 18 patients, 11 died and post-mortem studies were made on 8. All cases are reported in detail.

Early roentgen studies of the lungs in these patients reveal varying degrees of inflammatory change. A common finding is a haziness of irradiated portions. This is followed by the development of irregular patches of consolidation, which frequently coalesce and radiate outward from the hilum. Such changes may occur after a few massive treatments or after a single intensive course of irradiation over fields of moderate size. When the irradiated fields are large, concomitant pulmonary and pleural reactions are the rule. Adhesions may be observed between the pleura and pericardium, and between the diaphragm and pericardium or pleura. Pleural, pericardial, and occasionally interlobar effusions may occur. The late stages of severe lung damage are dominated by evidence of fibrosis. The normal architecture of the lung may disappear. Atelectasis of the involved areas and compensatory emphysema of the non-involved portions of the lungs are common. The diaphragm shows numerous adhesions. The heart and trachea are retracted toward the involved side. Pleural thickening may be marked and may obscure the lung markings. The thorax usually becomes markedly contracted. With the passage of years, fairly large and sharply outlined calcific plaques may appear in the irradiated lung or pleura.

Patients with lung damage of any extent show damage of varying severity to the overlying skin. When the total dosage is high, rarefying osteitis may occur in the ribs and fracture may result.

The earliest clinical signs are cough, which is usually non-productive, dyspnea, and pain at the site of treatment. Fever and sweating may occur. When permanent marked fibrosis occurs the cough is persistent, the dyspnea progressive and especially marked on the least exertion, and the chest pain severe. Repeated upper respiratory infections are

likely to occur. The end-stage of the severe type of reaction is characterized by symptoms of failure of the right side of the heart.

Macroscopically the irradiated portions of the lungs present atelectasis, a firm consistency, and increased resistance to cutting. The cut surfaces may show obliteration of the normal lung markings. Injection of the pleura, fibrinous deposits, and extreme thickening are observed. Microscopically, inflammatory changes are found in the lungs and pleura. Marked fibrosis and hyalinization may be present in severe cases. Hypertrophy or dilatation of the right side of the heart is frequently observed.

The authors conclude that massive doses of irradiation, particularly if repeated at close intervals, are likely to produce such changes as they describe, even if the total dosage is not high. Irradiation which is limited to the lung periphery is less likely to produce serious injury than heavy irradiation over the mediastinum and large vessels. Although no injury resulted with the earlier series in these cases, previous treatment can be the basis for later damage, if subsequent treatment is not given with great caution. Elderly individuals with arteriosclerotic changes are more likely to have pulmonary and pleural damage. Respiratory symptoms such as cough, dyspnea, and chest pain are danger signals.

HAROLD C. OCHSNER, M.D.

Wilkie, J.: Two Cases of Fluorine Osteosclerosis. *Brit. J. Radiol.*, 1940, 13: 213.

The literature relating to skeletal changes in individuals exposed to fluorine compounds is reviewed briefly. According to Roholm, cited by the author, the bone changes are generalized, although there is a predilection for certain places. The pathological process is a diffuse osteosclerosis in which the pathological formation of bone starts in both the periosteum and the endosteum. The bone densifies and thickens; the medullary cavity decreases in diameter. There is considerable new formation of bone from periosteum, and ligaments that do not calcify normally, or that calcify only in advanced age, undergo a considerable degree of calcification. All signs of bone destruction are absent from the picture.

Two cases with characteristic osteosclerotic changes are cited by the author with detailed descriptions of the roentgen findings, some of which are illustrated. Brief mention is made of differential signs from osteitis deformans, syphilitic osteitis, and osteoblastic metastases.

ADOLPH HARTUNG, M.D.

MISCELLANEOUS

Paschoud, H.: Ultraviolet Irradiation of Soiled Wounds (Irradiation ultra-violette, primaire, des plaies souillées). *Presse méd.*, Par., 1940, 48: 387.

The author reports 4 cases in which ultraviolet irradiation was used in treating soiled wounds. The author believes that his success in using ultraviolet irradiation warrants trying this method on wounded soldiers. His method is to wash out the wound, remove all evident devitalized tissue, then wash with hydrogen peroxide; after this the wound is irradiated with the ultraviolet rays and then it is sutured. The ultraviolet irradiation is done by means of a special apparatus which enables the tissues to be brought into direct contact with the rays.

FREDERIC W. ILFELD, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Farmer, C. J., Abt, A. F., and Chinn, H.: The Absorption of Vitamin C (l-Ascorbic Acid) from the Intestinal Tract in Health and Disease. *Quart. Bull., Northwestern Univ. Med. School*, 1940, 14: 114.

A review of studies on Vitamin C absorption and excretion is given, summarized as follows:

"In health, the absorption of Vitamin-C (l-ascorbic acid) from the intestinal tract is nearly complete. With ordinary oral intake, fecal excretion is usually not over 5 mgs. ascorbic acid in 24 hours. With massive oral doses (up to 1000 mgs. per day) the fecal excretion is normally under 15 mgs. per day.

"From experiments on rats and guinea pigs, Vitamin C is believed to be absorbed by diffusion or osmosis. No evidence of phosphorylation as a requirement for absorption through the intestinal mucosa could be obtained.

"No evidence of an enhanced fecal excretion accompanying high plasma levels could be obtained. The re-excretion of ascorbic acid from the blood into the intestine is considered unlikely, but cannot be excluded from our present state of knowledge.

"Certain types of bacteria have been cultured by special technic from human gastric contents and from guinea pig feces which will utilize ascorbic acid. Glucose is utilized in preference to ascorbic acid where it is simultaneously present.

"Under certain abnormal conditions of the gastrointestinal tract, associated with abnormal bowel movement (catharsis, diarrhea, ulcerative colitis) marked losses of orally administered Vitamin C may occur. These conditions frequently are severe enough to decrease the plasma ascorbic acid level as well as the amount excreted into the urine. In such cases, as well as in all others with low plasma ascorbic acid levels intravenous administration of large amounts (one gram daily) of ascorbic acid is an essential preoperative procedure."

PAUL STARR, M.D.

Johnson, J., Ravdin, I. S., Vars, H. M., and Zintel, H. A.: The Effect of Diet on Composition of the Liver in the Presence of Obstruction of the Common Bile Duct. *Arch. Surg.*, 1940, 40: 1104.

The histological picture of the liver in obstruction of the common bile duct is often one of extensive hepatitis, fibrous tissue replacement, parenchymal degeneration, and fatty infiltration. Prior to operation, tests of hepatic function may give little or no indication of the degree of injury to the liver parenchyma. However, subsequent to the trauma of operation and anesthesia, hepatic insufficiency may become so evident as to jeopardize the patient's life.

Because pre-operative preparation is of utmost importance, the authors performed experiments on dogs to determine the diet best suited to prepare the "bad risk" for operation in cases of disease of the liver.

The common bile ducts of 21 dogs were ligated, and specimens of liver were taken for assay of glycogen and fatty-acid content before and after the administration of various types of diet. Ligation of the common bile duct produced an increased hepatic concentration of fatty acids, much the same as is seen after obstruction of the common duct in man.

A high carbohydrate diet was given to one group of dogs for fourteen days, supplemented in part by intravenous glucose. This was found to produce a 50 per cent reduction in the mean concentration of fatty acids in the liver. A second group of dogs received a high carbohydrate regimen plus choline chloride. Although it was found that choline chloride exerted some lipotropic action when not administered in excessive doses, it was believed that a suitable high caloric diet would have resulted in a more significant decrease in the lipid concentration.

Seven dogs were fed a mixed diet, receiving half their total calories in the form of carbohydrate and a quarter each as protein and fat. The mean reduction in fatty-acid concentration over a seven-day period was 39 per cent, which is similar to that obtained when a high carbohydrate diet reinforced with choline chloride was given.

Another group of dogs received a high protein, high carbohydrate diet, in which 72 per cent of the total calories were in the form of carbohydrate and 28 per cent protein. With this regimen not only was the fatty-acid concentration of the liver markedly reduced in a minimal period, but the glycogen concentrations were all at, or considerably above, the normal level.

An adequate caloric intake is shown by the authors to be of great importance, and they feel that too much emphasis has been placed on the intravenous administration of dextrose to jaundiced patients and too little on the oral intake of food. From 3,000 c.cm. of a 5 per cent solution of dextrose the patient receives only 600 calories, which is a little more than one-third of the daily basal metabolic requirement. If the glycogen content of the liver is to be increased significantly, carbohydrates and other foods must also be given by mouth. To the extent that carbohydrates given by mouth displace liver fat and spare liver protein, the liver will be protected against the effect of certain hepatotoxic agents (volatile anesthetics). Regeneration of degenerated parenchymal cells requires protein, either endogenous or exogenous, which fact gives a new significance to the adequate oral intake of protein.

If the oral route of intake is impossible, the intravenous method should be utilized, but if there is no

contraindication to the oral route it should be used in order to maintain a high caloric intake. If the caloric intake is low, it is especially important that the diet contain no fat.

Thus, a high carbohydrate, high protein, no fat diet is recommended in the pre-operative preparation of the seriously ill patient with disease of the biliary tract. HAROLD LAUFMAN, M.D.

Scalzo, G.: Research Studies on the Nerves of the Human Umbilical Cord (Ricerche sui nervi del funicolo ombelicale umano). *Riv. ital. di ginec.*, 1940, 23: 253.

The author reviews the important literature and notes that most of the authorities on microscopic anatomy have concluded that no nerve fibers have thus far been demonstrated in the human umbilical cord. However, he examined the umbilical cord of 50 full-term fetuses by the Bielschowsky-Gros method. The cord was divided into three sections and these were studied in transverse and longitudinal views. He was able to demonstrate non-myelinated nerve fibers through the stroma and along the walls of the umbilical vessels, especially in the two-thirds of the cord near the fetus, but it was difficult to demonstrate nerve fibers in the other third of the cord.

Photomicrographs are presented which definitely illustrate these nerve fibers and fibrils.

JACOB E. KLEIN, M.D.

McDowall, R. J. S.: The Circulation in Relation to Shock. *Brit. M. J.*, 1940, 1: 919.

In his inaugural lecture on surgical physiology before the Royal College of Surgeons, McDowall reviews the essential nature of shock and denotes lines along which new knowledge is needed.

The vicious cycle of established shock leading to death is generally understood and agreed upon, but differences of opinion exist as to the initial nature of shock and the pathological states found which are related to the methods of production of shock. The pathological approach to the problem is obstructed by delay in securing authority for post-mortem examination and by the movement of the blood after death. From the standpoint of surgical physiology the "lost blood" is only half the problem in shock, and simply replacing it by transfusion often fails because of the reduced peripheral resistance. When the peripheral resistance of the circulation is reduced it is not possible to raise the arterial pressure without raising the venous and capillary pressure and thus increase capillary filtration. For this reason transfusion is of greater value in hemorrhage, which causes peripheral vasoconstriction. Unfortunately no satisfactory method of raising peripheral resistance is known. Drugs which are general vasoconstrictors act deleteriously on the heart and coronary arteries. The causes of shock in the probable order of their importance are: (1) hemorrhage, (2) toxins, (3) excessive vasoconstriction, (4) reflex vasodilatation, (5) excitement or depression, and (6) central exhaustion and injury with loss of carbon dioxide.

The modus operandi of obvious hemorrhage in producing shock is clear. The relative importance of concealed hemorrhage, as in a crushed limb, and the absorption or local action of toxins in such a limb are more difficult of evaluation. Even Dale now agrees that histamine is not the substance responsible for traumatic shock. Some other histamine-like substance, however, may be concerned. The main plank of the toxic theory was originally the observation of the onset of shock upon release of the tourniquet from the crushed limb. Blalock showed that the artery is more important than the vein, and that shock does not occur if the artery is clipped and the vein left open. This type of shock, therefore, is now interpreted as due to the taking up of blood by the injured part. Nevertheless, there are many phenomena which at present can be explained only by a toxic theory.

The rôle of the nervous system in shock is a subject of considerable confusion. Crile's idea of exhaustion of the vasoconstrictor center has been shown not to hold in the majority of instances, since the arteries are often constricted and the center still responds to suitable stimuli. This does not mean that the nervous system cannot play a rôle in other ways. The complex factor of overstimulation of the sympathetic adrenal system which can produce shock with blood concentration and low blood volume in experimental animals may operate clinically. Certain facts are very suggestive of such a nervous mechanism. For example, it is known that in injury and operation there is a considerable element of fear and pain, and that cold is detrimental to shocked cases. The common rise in the blood pressure preceding the onset of shock and the hemoconcentration preceding the fall in the blood pressure could be the initial result of overstimulation of the sympathetic adrenal system. The clinical importance of the sympathetic adrenal factor lies in the possibility that the administration of adrenalin-like substances may do harm, and that pharmacological agents which reduce sympathetic activity might be more desirable in shock therapy.

Another rôle of the nervous system in shock, in contrast to overstimulation of the sympathetics, may be an inhibition of the vasomotor mechanism through afferent stimuli. Experimentally this phenomenon can be demonstrated by a fall in the blood pressure resulting from slight repeated trauma such as tapping of the tibia. The results depend somewhat on the type and depth of anesthesia, but the immediate cause of the fall in pressure is uncertain. There are several objections to accepting this mechanism as the cause of clinical shock resulting from slight or severe trauma in unanesthetized patients.

The value or danger of anesthetics in clinical shock is also unknown. If the shock were on a purely neurogenic basis anesthetics should be of value. Lister made the observation that the use of chloroform materially reduced postoperative shock. This has been confirmed by many surgeons. However, in

obviously toxic shock the giving of an anesthetic, such as ether or chloroform, may cause a fatality. If the nervous factor is not contributing to the shock then all anesthetics, including morphine, should be avoided because they reduce the mechanism compensatory to hemorrhage and capillary dilatation.

Other fields of investigation in shock, such as the depression of the sympathetic system following stimulation, the loss of carbon dioxide with overventilation, and the relation of the adrenal cortex because of its effect upon capillary permeability and salt balance, require further study.

JOHN L. LINDQUIST, M.D.

Deckwirth, E.: The So-Called Scalenus-Anticus Syndrome (Ueber das sogenannte Scalenus anticus-Syndrom). Bleicherode a. H.: Carl Nieft, 1939.

The author has studied 500 x-ray films at the Surgical Clinic of Berlin with reference to the nature and frequency of the occurrence of anomalies of the cervical vertebræ. He found anomalies of the most varying grades in 19.2 per cent of the cases. Those of the mildest grade, which were placed in the Group 1a and 1b according to the classification of Gruber-Wanke (hypertrophic transverse processes and small rib spurs which do not encroach upon the transverse process), occurred twice as frequently (12.8 per cent) as the higher grade of cervical-rib formations which encroach more or less upon the transverse process, and may take on the appearance of a thoracic rib (Groups 2, 3, and 4, according to Gruber's classification). In Wanke's study, the relationship between these two grades was 10.5 to 6.5. Only a small portion of the cervical-rib anomalies present typical complaints.

By "scalenus-anticus syndrome," a term which the author has borrowed from Ochsner and Naffziger, is meant nervous and sympathetic as well as vascular complaints and disturbances in the region of the brachial plexus and the subclavian artery. Only those cervical ribs which are the cause of significant anatomical changes should be removed surgically. Milder conditions should be treated conservatively. In all cases which are characterized by muscular insufficiency, division of the anterior scalenus muscle is indicated (Adson-Coffey).

(WANKE). HARRY A. SALZMANN, M.D.

Combes, F. C., Dietrich, C., and Cohen, J.: Keratosis Blennorrhagica. A Brief Review and Report on the Effects of Hyperpyrexia in Its Treatment. *J. Am. M. Ass.*, 1940, 114: 2078.

Keratosis blennorrhagica is a distinct entity characterized by polyarthritis and cutaneous keratoses in the presence of a gonorrheal infection. The disease is rare; Keim in 1924 was able to find only 58 cases in the literature. In 1933 Chambers and Koetter listed 16 additional cases including 1 of their own. Since then the authors have found 19 case reports, which makes a total of 93.

The onset of keratosis blennorrhagica is insidious and follows chronic and recurrent attacks of gonorrheal urethritis associated with chronic prostatitis and seminal vesiculitis. Chills and fever of a septic type herald the appearance of each crop of new lesions. In extensive cases there is profound prostration, anorexia, and great loss of weight. The distribution of the eruption is symmetrical. There is a predilection for the soles and palms, genitals and groins. Less often the scalp, dorsum of the hands and feet, and the forearms and legs are involved. Lesions may also be found on the trunk, but this region and the face are not frequently affected. Barrett, Berman, Sherman, Blumenthal and Heidenreich, Genner and Boas, and Chambers and Koetter report lesions seen on the mucosa of the cheeks, tongue, and hard palate.

Briefly stated, the pathological process of the lesions of the palms and soles consists of vesiculation, pustulation, and crusting with associated keratosis. The lesions of the nails appear as a heaping up of yellow waxy material beneath the distal end of the nail plate. The nail itself becomes dry, brittle, and opaque and is lifted from its base. The free border is rough, broken, and jagged. These subungual hematomas are tender and may become painful.

In the mouth, flat confluent grayish papules are present; they are distributed irregularly over the hard palate, cheeks, and borders of the tongue.

There are also lesions of the joints, which usually precede the cutaneous lesions, although in rare instances they may be entirely absent. The joint manifestations differ from the usual gonorrheal monarthritis by the simultaneous involvement of a large number of articulations. The pains are excruciating, but there are not as much redness and periarticular edema as are seen in rheumatoid arthritis or in monarthritic gonorrheal arthritis.

The progress of the disease is chronic with remissions and recurrences and fresh crops of lesions attending the exacerbations of febrile and arthritic symptoms or induced by the therapeutic injection of gonococcus vaccine.

Modern treatment has improved the prognosis and favorably affected the duration of the disease. Local treatment is of little value. The most effective therapeutic procedure is the production of artificial fever by means of the inductotherm. The primary focus of infection must, of course, be eradicated. Non-specific protein therapy and general supportive measures are also indicated.

SAMUEL H. KLEIN, M.D.

Green, R. G., Goodlow, R. J., Evans, C. A., Peyton, W. T., and Titrud, L. A.: The Transmission of a Human Papilloma to Monkeys. *Am. J. Cancer*, 1940, 39: 161.

Persistent efforts by numerous investigators seeking to transmit malignant tumors from human beings to laboratory animals have failed to produce adequate proof of successful transmission or transplantation. Although considerably less work has been devoted to the transfer of benign and precancerous tumors of man, successful results have

been obtained much more frequently with these lesions than with malignant tumors. More extensive study along this line would seem to be warranted for, as precancerous lesions, benign tumors may be related to malignant growths. Moreover, many destructive tumors of human beings are made up of cells that are fundamentally benign. Adenomas of the islands of Langerhans and astrocytomas, for example, are benign in the sense that they usually grow rather slowly and do not metastasize; yet both are commonly fatal.

During the past two years the authors have attempted by various methods to transfer both benign and malignant tumors from human beings to monkeys and rabbits. Most of their experiments have yielded negative results. They have, however, obtained some positive findings that appear significant. In this article they report the transfer of a cutaneous papilloma of man to the macaca rhesus, with observations that strongly suggest the presence of a filtrable virus.

The tumor used in their experimental study was a small, highly cornified papilloma on the skin of the left upper eyelid of a man aged seventy-one years. Inoculation of the eyes of 3 monkeys with a saline suspension of this finely ground, cutaneous papilloma resulted, in all 3 cases, in the proliferation of conjunctival epithelium to form small tumors at the inoculation site. The injection of the tumor suspension was accomplished by passing the needle through the conjunctiva lateral to the limbus of the eye, then medially and anteriorly through the sclera, the outer border of the ciliary body, and the iris, into the anterior chamber. After a small amount had been injected into the anterior chamber, the needle was withdrawn, inoculating tissues in its path.

The tumors developed simultaneously after an incubation period of about thirty days, and attained maximum growth within the following thirty days.

Although it is possible that a heterotransplantation from man to monkey took place in the experiments, this is doubtful, for it is highly improbable that this would have occurred so uniformly in all 3 animals inoculated. It is well known that the direct heterotransplantation of tissues is rarely, if ever, successful among higher mammals (except, perhaps, as an independent tissue growth in the ocular chambers). Intensive study of serial sections of 2 of the 3 tumors produced in the monkeys revealed that the lesions were composed of hyperplastic epithelium continuous with the conjunctival epithelium. It seems most unlikely that human epithelium would merge with the epithelium of the monkey to produce such continuity. It is noteworthy that 3 tumors were produced by 3 inoculations of the same material. This fact, in view of general failure of the transfer of human tumors to animals, precludes an accidental result. All 3 lesions appeared simultaneously after an incubation period of about thirty days and all reached maximum or nearly maximum growth within another thirty days. These observations point to a uniform process as a basis of the growth of the tumors and suggest the presence of a virus. JOSEPH K. NARAT, M.D.

Treves, N.: Recent Therapeutic Measures to Control Pain in Cases of Incurable Cancer. *Med. Clin. North Am.*, 1940, 24: 595.

Treves reviews the use of drugs used for relief of pain in cases of incurable cancer. Narcotics should be used only as a last resort because many of the patients linger on for some time and the amount of drug needed for relief may then be very large. Mild hypnotics and sedatives should first be employed in minimal doses, the amount being increased when necessary. Phenobarbital, sodium amytal, nembutal, and seconal are recommended. When these fail, codin and, finally, morphine should be used. Dilaudid, being better tolerated, produces a more effective analgesia.

Intravenous alcohol infusions of 33 per cent ethyl alcohol solution are used in doses of 1 c.cm. of alcohol for each kilogram of body weight. They are administered through the usual infusion set at a rate of 30 or 40 drops per minute, and given every third day. The amount is increased until from 450 to 600 c.cm. are given at one treatment. Treves used this in 8 patients with relief in 6 and no relief in 2.

Large doses of calcium given intravenously give marked relief in metastatic carcinoma of the bone. Ten per cent calcium gluconate was given in a dose of 10 c.cm. three times a day for one month. However, this must be continued indefinitely. Because of the lack of vitamins, more striking results may be obtained with the addition of Vitamins A and D.

Cobra venom is supposed to work like morphine on the higher cerebral centers. Morphine works faster but its effect is lost rapidly. Cobra venom works slower but once analgesia is induced it lasts longer. The usual dose is 5 mouse units; 1 c.cm. ampoule is injected daily until analgesia is obtained. After that two or three intramuscular injections a week are sufficient. Treves found that in many instances analgesics and narcotics could be reduced and finally omitted after the venom had produced its analgesia.

Because of a lack of vitamin intake in carcinoma patients, large doses of Vitamin B_1 often tend to ameliorate the symptoms. The general improvement may lead to increased resistance to pain.

The use of these substances will not replace analgesics and hypnotics, but their administration often decreases the amount of such drugs that are used to control pain. JOHN J. MALONEY, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Mellon, R. R., Locke, A. P., and Shinn, L. E.: The Anti-Enzymatic Nature of Sulfanilamide's Bacteriostatic Action. *Am. J. M. Sc.*, 1940, 199: 749.

A new anti-enzymatic theory is offered for the basic mechanism of the therapeutic effectiveness of

sulfanilamide. Organisms in their growth elaborate toxic hydrogen peroxide, which may inhibit bacterial growth if it accumulates in sufficient concentration. Catalase, an enzyme found in blood, converts this peroxide into hydrogen and water and thus removes it, which accounts for the efficiency of blood as a bacterial medium. The experimental evidence of the authors indicates that sulfanilamide, when oxidized by the oxidative processes of the bacterial cell, assumes an anti-catalase activity and thus allows the hydrogen peroxide to accumulate to a point of becoming bacteriostatic and, secondarily, bactericidal, in coöperation with the host's protective powers.

In direct support of this theory is the demonstration by the authors of detectable peroxide in sulfanilamide containing three-hour growths of pneumococcus Type 1. After the third hour, retardation of the growth was apparent, and at five hours of incubation the magnitude of peroxide present was similar to the amount which had to be added to a control culture not containing sulfanilamide in order to cause a corresponding inhibition of bacterial growth.

In further support of the theory is the fact that oxygen is required for the production of hydrogen peroxide and, hence, for the inhibition of the germs. Thus, cultures maintained under decreasing oxygen tensions presumably contained decreasing amounts of hydrogen peroxide and therefore showed decreasing bacteriostatic effects. A low level of oxygen tension, 1 per cent, could be reached when bacteriostasis disappeared and no hydrogen peroxide could be detected chemically. As an incidental finding, under strict anaerobiosis bacteriostasis again appeared, possibly because of the reduction of the sulfonamide radical to a toxic sulfide form.

Chemical support of the theory is offered by the fact that sulfanilamide when partially oxidized, as it may be by the bacterial oxidative processes, becomes converted into a hydroxylamine derivative, and hydroxylamine is well known to have a strong anti-catalase effect. Acetylation of sulfanilamide blocks its oxidative capacity and thus should render it useless therapeutically; a test actually revealed this to be the case. It has likewise been possible physicochemically to demonstrate indirectly the accumulating presence of hydrogen peroxide in sulfanilamide cultures of the pneumococcus Type 1. As the quantity of an oxidizing substance increases in a solution the potential is elevated, and thus as the concentration of hydrogen peroxide mounts, so does the potential. By measuring oxidation reduction potentials it has been possible to correlate bacteriostasis with rising potentials and failure of static action with falling potentials of reducing solutions. This work is supported by similarly published reports written by Fox, German, Janeway, and Warren.

This theory, therefore, offers a working explanation for the efficacy of sulfanilamide against such diverse organisms as hemolytic streptococci, pneumococci, gonococci, meningococci, and colon bacilli, all aerobic organisms and all productive of hydrogen peroxide. The only exception to this generalization is the staphylococcus which, while aerobic, forms localized abscesses, and these prevent the oxidation of sulfanilamide because they become highly reducing environments. STANLEY ROBBINS, M.D.

DUCTLESS GLANDS

Bomskov, C.: The Thymus Hormone (Das Hormon des Thymus). *64 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1940.

By chemical fractioning of the hypophyseal hormone we have determined that the growth hormone of the hypophysis is identical with the diabetogenic hormone. The action of this hormone consists in an extraordinarily intense decrease in the liver glycogen in the experimental animal and an increase of the blood-sugar level and excretion of sugar in the urine. From these results, the conception "growth" may be replaced by the conception "mobilization of carbohydrate" with the qualification that this mobilization is not, as in the case of thyroid action, expressed as an increase of energy requirements, but as an increase of tissue. The diabetogenic hormone (growth hormone) has no influence on the basal metabolism. It is shown that it represents the thymotropic hormone of the anterior lobe of the hypophysis, i.e., that its effects can be procured only in the presence of an intact thymus. The removal of the influence of the thymus in the experimental animal is obtained only by roentgen irradiation, never by operative procedures. These findings afford the test in our search for the thymus hormone.

The thymus hormone is present in the fatty fraction of the thymus, i.e., it is a lipoid which exerts an extraordinarily intense diabetogenic effect and a growth effect. The thymus hormone produces an intense leucocytosis and lymphocytosis in experimental animals and in the human being. It acts exactly as the thymotropic hormone, being markedly diabetogenic because it decreases the liver glycogen and increases the blood sugar. The hormone of the thymus inhibits the development of the sex glands and with administration over long periods, leads to atrophy of the functioning sex glands. The effects of the thymus hormone are an outspoken infantilism. The hormone of the thymus gland has no effect on the basal metabolism. It increases the weight of the thyroid gland in the guinea pig but little; it produces, histologically, the picture of colloid retention in the thyroid gland. As judged from the basal metabolic readings, the thymus hormone prevents the metabolic increase which would otherwise accrue with the injection of thyreotropic hormone in the guinea pig. This inhibiting effect may likewise be demonstrated histologically on the thyroid gland. There is, therefore, an antagonism between the thyroid and the thymus glands, and the phenomenon of thymic hypertrophy in Basedow's disease is the expression of a compensating action on the part of the thymus gland.

It is shown that in animal experiments a status thymicolymphaticus may be induced by injections of thymus hormone, and that in this condition, exactly as in the case of the human being, death may result from the slightest of external influences. Especially marked is the sensitivity to choloroform of the thymus-treated animal. Status thymicolymphaticus is, therefore, a manifestation of hyperfunction of the thymus gland.

It is found that thymic death is an acute cardiac death induced by a lack of heart-muscle glycogen. It is demonstrated that in the rat and in the guinea pig the thymus hormone may produce a marked decrease in the glycogen content of the heart muscle. It is brought out that in infants similar conditions are found physiologically, as both the liver glycogen and the glycogen of the cardiac muscle, when apposed to values found in the adult, are under normal.

With reference to the occurrence of the thymus hormone, the hormone is present in larger amounts only in the thymus of younger animals; in older animals the content is much lower. From one-tenth to one-twentieth of the amount present in the thymus gland may be found in the lymph glands and spleen; it depends upon the volume of the thymus. The hormone is not present in the serum in free solution as the other hormones; it is bound to the lymphocytes. The lymphocytes must, therefore, be regarded as the carriers of the growth principle. It is believed that the lymphocytes produced in the lymph glands are drawn to the thymus gland, filled with the hormone, and then stored in the cortex of this organ; they are then given off to the blood and broken up at the place where needed. Various proofs are advanced for this theory, among others, the demonstration that only the stratum of white corpuscles of the blood contains the thymus hormone. It is shown further that in a number of different diseases which begin with a lymphocytosis there is a marked secretion of thymus hormone. A method is given for demonstrating the excretion of thymotropic hormone and thymus hormone in from 50 to 100 c.cm. of urine. Finally, it is shown that myasthenia has nothing to do primarily with the thymus; the thymic hyperfunction in myasthenia is a secondary phenomenon produced by primary changes in the suprarenal cortex.

The experimental results here reported were procured on a material consisting of several thousand experimental animals.

(Bomskov). John W. Brennan, M.D.

Rehn, E.: The Thymus Hormone from a Clinical Standpoint (Das Thymushormon unter klinischer Betrachtung). *64 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1940.

The hormone of the thymus gland is one of the most important factors in the processes of living and of growth. Of the innumerable problems in connection with this hormone we will here discuss that of hyperfunction of the thymus. The starting point for clinical study of the thymus is the possibility of demonstrating, and the quantitative determination of, the function of the thymus.

In dysfunctions, particularly hyperfunction, there is a severe disturbance of hormonal balance, which finds expression in a very well defined organic lability. Hyperfunction of the thymus leads to glycogen impoverization of the heart and liver. This new form of glycogen depletion resembles in its hormonal origin the liver disturbance of thyroid origin demonstrated by Rehn, but it differs from it essentially. The thymic variety eventuates early with glycogen exhaustion of the liver and thereby attains the highest grade of lability. Herein resides the essential character of status thymicolymphaticus, and an explanation of the specific lability of children toward operation and narcosis is made possible. The intense hormonal activity of the period of puberty includes that of the thymus, and it is in connection with the latter that acromegaly and eunuchism have their origin. The constitutional status thymicolymphaticus is found also in the adult and may be induced in man and animal artificially by the administration of thymus hormone. A hyperfunction of the thymus has been suspected and proved in morbus Basedow, carcinoma, infections, and toxic affections, and in lymphogranulomatosis. In these diseases the participation of the thymus gland is definitely established by a quantitative test for the hormone in the urine. Fifty cubic centimeters of urine suffice for the determination of the thymic and thymotropic hormones. The normal limits of excretion go as high as 200 mouse units. Further indications are, in addition, a lymphocytosis, leucocytosis, hyperglycemia, and, lastly, myasthenia; the last named, however, results from an accompanying effect of the thymus on the suprarenal glands.

In Basedow's disease the hyperfunction is secondary and primary; in the first type the effect is an entirely laudable reaction to the thyreogenic Basedow's disease on the part of the thymus, in the second, the hyperfunction is an expression of a disturbance of the entire gamut of hormonal correlations. There must be distinguished a pure thyreogenic Basedow's disease, a thymothyreogenic, and a thyreogenic Basedow's disease with secondary participation of the thymus. These forms can be definitely determined and from this fact arises the possibility of defining these forms in advance and of working out definite precepts for their treatment. In the thyreogenic Basedow's disease a cure may be obtained by resection of the thyroid gland without risk if there be proper pre-operative preparation of the patient with iodine, or by the administration of thymus hormone after its antagonistic action on the thyroid gland has been ascertained. In the future, in patients with Basedow's disease in whom there is involvement of the thymus both organs must receive preliminary treatment; the operative menace must be reduced by weakening the influence of the thymus, and then the operation should be performed with or without the pre-operative administration of

iodine, the method depending upon the basal metabolism. In the future, in every case of Basedow's disease there must come to test, not only the basal metabolism, but also the function of the thymus. In the cases of carcinoma, in which operation is dangerous, there has been found a marked involvement of the thymus, a condition of lability such as is encountered in the much feared status thymicolymphaticus. In these cases the thymus condition is for the present to be regarded as secondary; the same thing may be demonstrated in the child with an acute purulent osteomyelitis and with severe general infections. This is undoubtedly a toxic induced irritation of the thymus. Of the greatest importance are the results of the study of lymphogranulomatosis, in one case of which a thymus hyperfunction of such enormous proportions was found that at the period when the patient was examined a severe hormonal disturbance had to be assumed.

Manifestations speaking for marked involvement of the thymus in Hodgkin's disease are: (1) intense hyperfunction of the thymus; (2) the demonstrated interrelationship between the thymus and the lymphatic system; (3) the adduction of marked leucocytosis and lymphocytosis by the giving of a few milligrams of thymus hormone; (4) the marked irritation of the lymphatic system by the hormone administered; (5) the increase in Hodgkin's disease at the period of puberty; and (6) the results from irradiation of the thymus in cases of lymphogranuloma.

All the glimpses into the nature of hormonal processes, the purport of which cannot yet be foreseen, lead to the expectation that with the theoretical basis now established ever wider and more definite results will be forthcoming.

In the discussion SUNDER-PLASSMANN demonstrates in the thymus and thyroid, special, large, clear cells, which, on the one hand, show the closest kind of plasmatic connection with the vegetative nervous system, and on the other, stand in close relationship to the colloid resorption of the thyroid. In the thyroid which has been activated with thyreotropic hormone, they are present in great numbers. In the Basedow struma, however, they are just as plentiful. These are the cells which are the most important in the epithelization of the thyroid and the thymus in Basedow's disease. Sunder-Plassmann designates them neurohormonal cells (nh cells). They are perhaps identical with the "interstitial" cells of Cajal in the walls of the stomach and intestines. In Basedow's disease they migrate in large numbers from the thymic medulla into the follicular complex of the thyroid, and during this migration some are found in Schwann's terminal plasmodium of the perivasal nerve plexus, and some in the neuroreticulum of the peritracheal loose fatty tissues; then they produce an increase of the incretin-secretion of the thyroid.

Sunder-Plassmann's results support the theory that the enlargement of the thyroid in Basedow's disease, particularly of the medullary hyperplasia, represents, in the sense of Haberer, a manifestation of aggravation of this disease.

(REHN). JOHN W. BRENNAN, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Etcheverry, M. A., Battaglia, A., and Tropeano, A.: Chediak's Microreaction (Microrreacción de Chediak). *Rev. méd.-quirúrg. de patol. femenina*, 1940, 15: 251.

Chediak's microreaction for the diagnosis of syphilis requires only one drop of desiccated blood; the necessity of puncture of a vein, which is undesirable in anxious patients or difficult in those with sclerotic blood vessels, is thus avoided. Furthermore, the technique of the reaction does not require syringes, pipets, or test tubes. The antigen is added and the specimen observed under the microscope. The presence of black granules indicates a positive reaction.

The authors performed 1,127 Chediak microreactions in conjunction with the Wassermann and Kahn reactions. When the last two reactions were positive, Chediak's reaction was also positive. The Chediak reaction was also positive in 98.6 per cent of the cases with a positive Wassermann reaction, and a corresponding result was obtained with the new reaction in 97 per cent of the cases with a positive Kahn reaction. In 10 of 835 patients with a negative Wassermann and Kahn reaction, a positive Chediak reaction was recorded.

The authors highly recommend the Chediak reaction for the diagnosis of syphilis. Non-specific positive reactions do not exceed 1 per cent. The sensitiveness of the Chediak reaction is approximately the same as that of the Kahn and is superior to that of the Wassermann reaction.

JOSEPH K. NARAT, M.D.

EXPERIMENTAL SURGERY

Noble, G. K., and Wurm, M.: The Effect of Testosterone Propionate on the Black-Crowned Night Heron. *Endocrinology*, 1940, 26: 837.

The authors carefully describe changes which both sexes of the black-crowned night heron undergo during the breeding season. These changes consist of a marked increase in the pigmentation of the lower mandible and buccal cavity, and an intense vascularization of the legs which gives them a pink color. These modifications disappeared following gonadectomy. Testosterone propionate injected in large doses was found to produce these sexual changes in immature herons and in gonadectomized adults. The estrogens, on the other hand, had no effect on the secondary sexual characteristics. It was concluded, therefore, that the secondary sexual characteristics of the night heron were produced by the androgen in both sexes. Both testosterone propionate and the estrogens were observed to cause an enlargement of the oviduct of the spayed night heron, though only the estrogens were found to

produce a hyperplasia of the mucosa. The epididymis was hypertrophied by testosterone propionate but was unaffected by the estrogens.

Testosterone propionate induced male sexual behavior in adult females or in immature birds of both sexes. It was observed to make the voice guttural even in month-old chicks. One-month-old chicks being treated with testosterone demonstrated the drive for territory defense and nest building, all male courtship ceremonies, copulation, and later brooding. Differences between the male and female behaviors in adults seemed to be regulated by the amount of androgen in the tissues of the two sexes. Estrogens alone failed to stimulate any breeding behavior in either sex. RULON W. RAWSON, M.D.

Cazzola, D.: A Contribution to the Question of the Relations Between Sexual Hormones and Foà Kurloff bodies (Contributo alla questione dei rapporti tra ormoni sessuali e corpi di Foà Kurloff). *Folia demograph. gynaec.*, 1940, 37: 170.

Cazzola recalls the experiments of Babudieri who thought that it might be possible to use the Foà Kurloff bodies as a test for the dosage of male and female hormone preparations and who obtained some promising results. Therefore, the author decided to repeat these experiments from the practical point of view in order to verify whether the new diagnostic method could be applied to everyday laboratory investigations. He used newly born guinea pigs (aged one or two days) of both sexes. First he determined the number of Foà Kurloff bodies present in the blood and then injected on two consecutive days 2 c.cm. of urine from women in various stages of pregnancy. The blood was examined from the third day on until the number and the morphological aspect of the Foà Kurloff bodies returned to normal.

He found that in the successful experiments the number of bodies increased gradually from the fifth day after the beginning of the treatment, when an average of 3 per cent was observed, to reach 5 or 6 per cent on the ninth or tenth day, and then to decrease more or less rapidly toward normal. The same experiments were also made with urine from women in the four first days of the puerperium, and controls were instituted with urine from non-pregnant women and from male subjects: the controls always gave negative results. However, investigations on young guinea pigs which had not been treated with urine from pregnant women showed that the number of Foà Kurloff bodies also increased gradually during the first days of life to reach percentages which, although lower, did not differ much from those of the treated animals.

He presents the following conclusions:

The Foà Kurloff bodies react with an increase to the injection of urine from women in the seventh to ninth months of pregnancy, but they do not show any change when the urine of the first months of pregnancy is used. The gonadotropic hormone does not influence the number of the bodies, the increase of which must be attributed to the action of the follicular hormone present in the urine. During the first days of the puerperium, the decrease of folliculin is associated with a rapid, progressive fall in the number of the bodies. All animals do not react with equal intensity to the injection of urine. The injection of 4 c.cm. of urine during the first two days of life kills many guinea pigs. If the treatment is prolonged with doses increasing from 0.5 to 2 c.cm. of urine for more than five days, all animals are saved and the percentage of Foà Kurloff bodies is increased, the reading being deferred to the tenth, eleventh, or twelfth day. From the theoretical point of view, the diagnostic method of Babudieri has an undoubted value, but it does not seem probable that it will enjoy any extensive practical applications.

RICHARD KEMEL, M.D.

Dill, L. V., and Isenhour, C. E.: An Attempt to Produce Increased Susceptibility to Renal Ischemia in Rabbits by Means of Endocrine Preparations. *Endocrinology*, 1940, 26: 863.

The authors, believing that the agents which convert the renal-ischemia syndrome from a benign hypertensive state in the non-pregnant animal to a malignant fatal disease in the pregnant animal might be hormonal, undertook experiments designed to determine if one or more of the commonly used glandular extracts were able to change the response of the non-pregnant rabbit to renal ischemia.

Rabbits weighing between 2 and 3 kgm. were given varying dosages of several commercial preparations. While receiving the hormone preparations, the rabbits were subjected to renal ischemia by moderate equivalent constriction of the aortas (with a silver wire) proximal to the points of origin of the renal arteries. The following hormones were given intramuscularly three times daily: amniotin in daily doses of 7,200 I.U. and 14,400 I.U.; proluton in daily doses of 3 mgm. and 6 mgm.; eschatin in daily doses of 3 c.cm. and 6 c.cm.; follutein in daily doses of 500 R.U. and 1,000 R.U.; and pitocin in daily doses of 30 and 60 O.U.

None of the animals receiving these preparations showed significant variations in the urine findings, blood-pressure levels, or histological changes in the liver and kidney, in comparison with animals in which equivalent aortic constriction had been performed. Animals receiving from 60 to 120 p.u. of pitressin showed albuminuria, depression of the blood pressure, and lesions of the kidney, liver, adrenal, myocardium, and gastric mucosa when subjected to comparable renal ischemia. The kidneys showed moderate cloudiness of the parenchymatous tissue; the glomeruli were normal, and occasionally a convoluted tubule containing a few hyalinized cells with pycnotic nuclei or a moderate amount of albumin was seen in the lumen. In the more seriously injured organs the convoluted tubules were converted into hyalinized semblances of the former tissue; the nuclei were absent, and the lumina obliterated. The livers of these animals frequently showed some cloudy swelling which on microscopic

examination proved to be focal and usually sharply outlined, beginning in the peripheral one-third of the lobule and extending to the central vein. The liver cells in these areas were confluent masses of hyalinized material in which the nuclei were pycnotic and the sinusoids were either partially or completely obliterated.

While using approximately the same doses of pitressin in control animals in which aortic constriction was performed below the point of origin of the renal arteries, the authors observed similar blood-pressure, urine, and pathological changes.

They did not observe any synergistic effect of these preparations on the course of animals subjected to renal ischemia. RULON W. RAWSON, M.D.

Stark, W.: Experiments on Rabbits with "Os Purum" and "Os Novum," Respectively (Kaninchenversuche mit "Os purum" bzw. "Os novum"). *64 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1940.

Experiments are reported on two series of 20 rabbits in which previously regenerated "os purum" and "os novum," respectively, were transplanted. In the first series an "os purum" graft was implanted in a previously set partial or total gap in one of the two front leg bones, and left there for about twelve weeks. In an identical gap on the left side an autoplastic graft taken from the right side was implanted as a control graft. Illustrations were taken immediately after implantation and after three and five months, respectively.

In the second series the method of the Swedish surgeon Orell was followed, and an "os purum" graft was implanted for the purpose of creating "os novum" under the periosteum of either the ilium or ischium, or of the femur or ribs, respectively, and left there for about eight to twelve weeks. A second operation consisted in transplanting the new, red, moist, and soft osseous tissue formed around this graft, the actual "os novum," to the right side, either alone or together with the "os purum" graft, as had been done in the first series, while on the left side an autoplastic graft was placed for control or the defect was left to heal spontaneously. Roentgenograms were taken after the operation at the same intervals as indicated for the first series. Some roentgenograms taken before the second operation showed already after eight weeks the dark shadow of an osseous tissue between the "os purum" graft and the bone.

The roentgenograms and the experimental results proved that "os purum" heals less easily and more slowly than an autoplastic bone graft. However, it heals and remains encased without being thrust off. "Os novum" appears to be the ideal osseous grafting material, which can be produced excellently by the transplantation of "os purum" under the periosteum. It heals and forms new bone in much less time than it would take for simple healing of the set osseous gap, which, according to the illustrations, also healed well. "Os purum" plus "os novum" also appears to heal more slowly than pure "os novum" alone. At times, however, we cannot spare the mechanical effect produced by the simultaneous transplantation of a bone graft.

(STARK). HILDA H. WULLEN.